Morgan Stanley

October 18, 2010

MORGAN STANLEY BLUE PAPER

Petrochemicals

Preparing for a Supercycle

An inflection point in the global plastics market, driven by China and India: After a recent period of slower growth and a decoupling from global GDP growth, we now expect the strongest period of ethylene demand growth in the past 20 years. We forecast that in the next five years, incremental annual consumption in China and India alone will equal the total current consumption in the US, until recently the world's largest ethylene consumer, and still responsible for 15% of the market.

Our global supply/demand model suggests ethylene utilization rates will tighten. We forecast strong demand growth, averaging 5.6% in 2009–14, and also expect the supply outlook to improve. The credit crunch has halted infrastructure investment by industry titans, and the Middle East appears to be exhausting feedstock quotas. Thus, global capacity should grow at just 2.3% in 2011–14. Utilization rates are set to tighten from 85% today to 92% in 2014, resulting in improving margins and returns globally.

Implications: In the US, with its advantaged natural gas–based feedstock, cash margins in the next cycle should be 2.4x the average of the past 20 years. Dow and LyondellBasell should be the main beneficiaries. Asian utilization rates are set to tighten the most from current low levels. In Asia/Middle East, we prefer companies with exposure to gas-based feedstocks such as PTT Chemicals and SABIC. Europe should remain structurally weak due to low demand, high feedstock costs, and proximity to potential Middle East imports.

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Chemicals

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New Coverage

Company Name	Rating	Price Target
LyondellBasell (LYB.N)	Overweight	$37

What's Changed

	Price Target		2010e EPS		2011e EPS	
Company Name	New	Old	New	Old	New	Old
BASF (BASFn.DE)	€60	€58	5.03	4.87	5.27	5.13
SABIC (2010.SE)	SAR115	SAR110	7.05	6.32	8.78	8.17

Source: Morgan Stanley Research e = Morgan Stanley Research estimates

Petrochemicals — Preparing for a Supercycle

We think petrochemicals are entering the strongest period of sustained demand growth seen in the past 20 years. This is far from the consensus view, which anticipates weak ethylene demand, based largely on uncertainty regarding the recovery of the US and European economies.

The future will look quite different from the past, we think, as developed economies are likely to have little impact on ethylene demand growth.

Unlike in the past, we expect emerging market demand to drive the recovery. China and India are likely to have a dramatic effect on the entire value chain globally. We estimate that over the next five years, those two countries together will increase their consumption of polyethylene by 10.5 million tons, equivalent to the current US consumption. Their low per capital consumption — we estimate China at less than 30% of the peak US per capital consumption today, and India at just 5% — suggests significant potential upside for overall consumption.

Debate Centers on Demand, Supply, and Margins; Our Outlook Is Bullish on All Three

Ethylene demand growth has decoupled from global GDP growth, in our view. From 1990 to 2000, global ethylene demand growth averaged 5.0%, or 1.9x global GDP growth. However, from 2000 to 2009, it averaged just 2.5%, or 1.1x global GDP growth. We think the market is focused too intently on a continued weak economic outlook in the developed world and low global GDP growth.

Following our in-depth analysis of end markets for each ethylene derivative, we expect very strong demand growth of 5.6% over the next five years:

- Our base case — a 5.6% CAGR in global ethylene demand in 2009–14 (or 1.3x our economists' forecast of global GDP growth) — assumes a very modest rebound in per capita consumption in the US and Europe.
- Our bull case — a 7.8% CAGR in global ethylene demand in 2009–14 (or 1.5x our economists' forecast of global GDP growth) — assumes a recovery of the US and European demand.
- Our bear case — a 4.0% CAGR in global ethylene demand in 2009–14 — assumes that US demand continues to decline, with per capita consumption falling in line with the drop witnessed in 2004–07.

Our base case is favorable enough for us to be comfortable owning petrochemical producers with advantaged feedstock positions. The margin leverage that would result in our bull case drives upside to our outlook, and is likely not fully appreciated by the market.

In addition to underestimating demand, we think consensus is overestimating supply. We see two structural problems limiting investment in new facilities:

- The Middle East (excluding Qatar) is clearly limited in natural gas reserves. The reserves available to Saudi Arabia and other Middle Eastern regions have allowed them to develop 41% of the new capacity in 2009–11e. But there is a clear slowdown in new openings in the Middle East beyond 2011, suggesting that petrochemical companies have exhausted available quotas of cheap natural gas. As a result, there should be few "feedstock-advantaged" new facilities during the next 3–4 years and the majority of new capacity will sit high on the cost curve.
- The global credit crunch has squeezed finances at most petrochemical producers, limiting expansions.

On our estimates, supply growth is set to average just 2.8% in 2010–14.

The Sources and Uses of Ethylene, the Most Widely Used Petrochemical

Ethylene — the largest organic hydrocarbon produced and consumed globally — is the starting block for many basic plastics and fibers, used in every day life. Because it is a highly explosive gas, very little ethylene is traded globally. The vast majority is used entirely to produce more stable downstream derivates, which are raw materials for a variety of industrial and consumer products.

Exhibit 1

Global Ethylene Demand by Derivative and End Market

Major Ethylene Derivatives	World Ethylene Consumption	End Uses
Polyethylene	59%	Plastic film, containers, coatings
Ethylene Dichloride	12%	PVC films, coatings, pipes
Ethylene Oxide	14%	Antifreeze, polyester, detergents
Ethylbenzene	7%	Polystyrene packaging, ABS resins
Alpha Olefins	3%	Comonomers, lubes, detergents
Vinyl Acetate	1%	Adhesives,, packaging
Other	4%	Various applications

Source: CMAI, Morgan Stanley Research estimates

Strong demand combined with a lack of new capacity means utilization rates look set to tighten significantly. On our estimates, global utilization rates bottomed out during 2009 at 84%; we believe they will reach 88% in 2012 and 92% in 2014, well above their 20-year average rate of 89%. Our bull case sees global utilization rates reaching 94% in 2012 and 98% in 2014, while our bear case sees utilization rates remaining broadly at their current levels.

Global utilization rates have historically correlated well with global petrochemical margins. Thus, improving utilization rates would lead to improving cash margins for the global petrochemicals industry over the next 4–5 years.

Industry EBITDA margins declined by 900 basis points between the last peak (2005) and the trough (2008), and have regained only 300 basis points of margin since then. EBITDA margins currently reside some 130 basis points below the previous cycle's mid-cycle margin and some 580 basis points below peak levels seen in the past cycle. While margins have risen from the trough, unlike many specialty chemicals (where margins appear close to peak levels), there remains plenty of room for margin expansion, we think.

Our base case 2012 profit forecasts for US producers are, on average, 184% above consensus, which we think is too bearish on both US input costs (i.e., ethane) and global selling prices (which are based on crude oil).

Exhibit 2

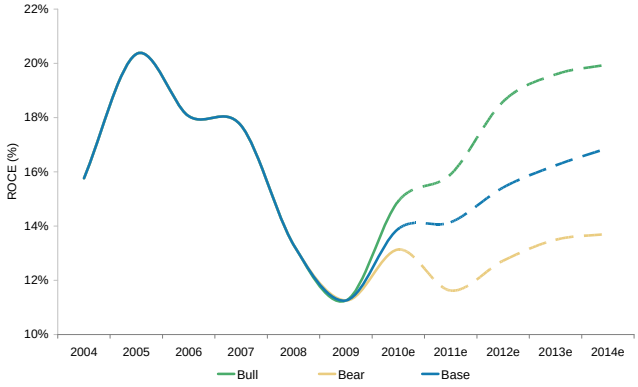
Global Petrochemicals: EBITDA Margins (2004–14e)

Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

ROCE for the global petrochemicals industry also declined by 900 basis points from peak (2005) to trough (2009), and has risen from its trough level of 11.3% only to 13.6%. While we expect a fairly flat 2011, we expect 2012 ROCE to reach 15.4% in our base case.

Exhibit 3

Global Petrochemicals: ROCE (2004–14e)



e = Morgan Stanley Research estimates
Source: Company data, Morgan Stanley Research

Investment Implications: Regions

Clearly, some regions will outperform others at different stages of the cycle. However, we think all companies that have survived the past 18 months — among the toughest in the history of the petrochemical industry — appear positioned to benefit from rising utilization rates.

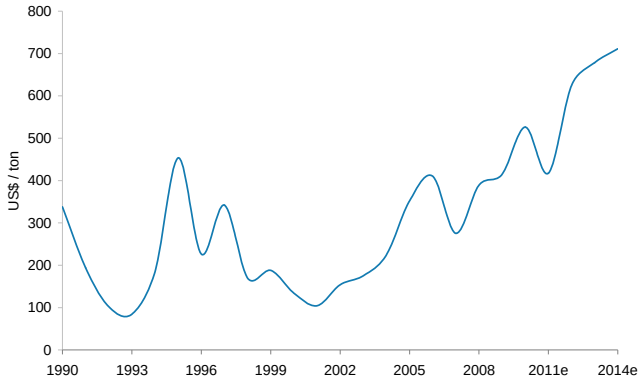
North America

The market does not appreciate US cash generation across the cycle, we think. Utilization rates are already >90%, so there is little upside to regional utilization rates; however, with 20% of US petrochemicals exported (predominantly to Northeast Asia), margins will benefit from global utilization tightening.

The key driver of North American petrochemical margins in the medium term will be relative feedstock ratios (ethane to crude oil). In 2011, consensus forecasts are already optimistic about the North America feedstock advantage, and we see modest downside risk to consensus 2011 margin estimates. Longer term (2012+), however, we think consensus forecasts do not take account of the advantaged nature of US feedstock. We expect cash margins to positively surprise by ~80% in 2012–14. On our estimates, between 2010 and 2014, US cash margins are likely to be 2.4x the average achieved in 1990–2009. Investors likely do not appreciate the free cash flow that the US petrochemical companies will generate during the next five years.

Exhibit 4

Cash Flow from US Petrochemicals Should Be 2.4x the Historical Average During the Next Cycle



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

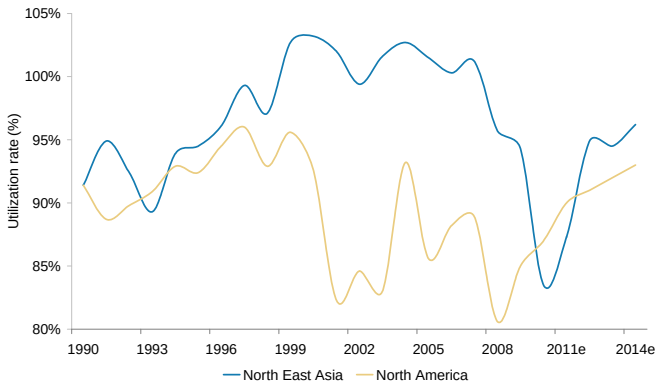
Asia

Asian petrochemical companies are best positioned globally to benefit from tightening utilization rates. Two large ethylene crackers are to start production in Thailand in 1Q11, likely pushing utilization rates lower in Asia; however, we think this will marks the bottom of the cycle for the Asian petrochemical industry. Margins will likely fall in 1Q11, but Asian companies are entering what we think are the final months of a tough period that has seen utilization rates drop from ~95% in 2008 to <80% in 2010. Within a few months, we think the outlook will start to improve significantly. With utilization rates in some regions at ~75% and a disadvantaged feedstock, Asia potentially has the most to gain from tightening utilization rates and will likely see the greatest improvement in returns during the early stages of the tightening cycle.

Exhibit 5

Asia Better Leveraged to Tightening Utilization Rates

Utilization rates in Asia have just reached trough; US rates have largely recovered



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Europe

Returns in Europe are most at risk from a double-dip recession than elsewhere. On our estimates, utilization rates in Europe are low (<80%). The region is likely to see low demand growth (with demand growth coming from Eastern Europe rather than Western Europe). Given its disadvantaged feedstock, the region is unlikely to be a significant exporter, and thus will not benefit directly from the growth we anticipate in Asia. We expect no capacity additions in Europe; however, given its proximity to the Middle East, Europe remains at risk of imports from feedstock-advantaged countries such as Saudi Arabia and Kuwait. We have historically seen a strong correlation between global ethylene utilization rates and European ethylene cash margins, based on typical naphtha feedstock costs.

Investment Implications: Companies

LyondellBasell

We rate LyondellBasell Overweight. The company emerged from bankruptcy in 2Q10 and is the most leveraged stock to the global petrochemical industry in the US chemicals industry. The company derives 49% of its petrochemicals revenues and 54% of its petrochemicals profits from the US. While we believe Europe will remain structurally challenged, we think the US petrochemical companies are positioned to earn cash flows 2.4x the average earned during the previous cycle. The duration of the North American cost advantage is not well appreciated by consensus or reflected in current valuation, we believe. We forecast that LyondellBasell will earn free cash flow equal to 45% of its current enterprise value in the next four years. The stock is trading at 19.4x 2011e EPS, although this is distorted by the company's high interest expense, which we expect will normalize by 2013. On EV/EBITDA, LYB trades at 6.5x our 2011 estimate — too low, we think, given the expected growth over the next 3–5 years. At our $37 price target, the stock would trade at 12.2x 2013e EPS of $3.03 and 6.1x 2013e EBITDA of $3.9 billion.

PTT Chemicals

We rate PTT Chemicals Overweight. The stock offers an attractive risk-reward profile, as its structural cost advantages along with expansion plans more than offset risks associated with low ethylene utilization rates in the medium term and new global supply, in our view. We expect PTTCH to have among the highest earnings growth in the SET50 at a 55% CAGR in 2009–12. Our price target of Bt162/share implies 22% upside from current levels.

PTTCH is increasing its cracker capacity by 50% (to 2.9mntpa) and is more than doubling its polyethylene capacity

(to 1.2mntpa) in the next six months. With most projects completed, the risk of project delays appears minimal, and the company expects to start full operations in 2Q11. We expect PTTCH's cracker to run at 85% capacity in 2011 and 100% in 2012.

Gas makes PTTCH one of the lowest-cost producers in Asia, thanks to low feedstock costs, economies of scale, and proximity to the feedstock. With an ethylene cash cost of $570/ton, PTTCH is one of the lowest-cost producers in Asia, where costs run $900/ton. PTTCH's earnings are driven by ethylene prices, and hence crude oil prices. The stock has a 60% correlation to crude oil prices; a $1/bbl rise in crude oil prices boosts its EPS by 1.5%, on our estimates.

PTTCH trades at a 2012e P/E and EV/EBITDA of 8.0x and 5.6x, respectively, a 10% discount to peers. The company has a P/B of 1.5x with ROE of 21.6% and gross margin of 28% for 2012e. Downside risks: 1) Ma Tha Phut pollution issue may hamper production growth in 2011; 2) PTTCH's feedstock advantage will erode with low crude oil prices.

SABIC

We rate SABIC Overweight. Our new price target is SAR115 (up from SAR110), implying ~30% upside to the current share price. We are raising ModelWare EPS by >10% near term, reflecting the much-anticipated rebound in Asian petrochemical prices through 3Q (up 13%, on average, from lows in the quarter), as well as more favourable conditions for the nitrogen fertiliser market (Yuzhny urea prices have recovered from lows of $220–240/mt in May/June to $320–340/mt today). SABIC has a relatively fixed feedstock base (close to 70% of its domestic ethylene capacity is based on natural gas sourced from Saudi Aramco at a contracted price of $0.75/mmbtu). The company's petrochemicals activities account for 85% of sales and 76% of EBIT and ModelWare EPS, and this is the division where we have flexed assumptions as part of this report. In response to our analysis, we have recalibrated our risk/reward analysis: Our new bull case valuation is SAR155; it is based on ethylene utilisation rates rising to 98% by 2014, leading to record margins in SABIC's petrochemical activities. We see bull case EPS of >SAR17 medium term.

The Dow Chemical Company

We rate Dow Overweight with a price target of $41, some 40% above current levels. On our estimates, approximately 22% of Dow's revenues and 35% of its profits are derived from petrochemicals. In our view, the current valuation fails to reflect the margin outlook for the basic plastics division or a number of other profit drivers such as SmartStax and Dow-Corning. Our base case forecasts assume that Dow achieves a basic plastics EBITDA margin of 22% in 2012, which we believe is some way ahead of consensus. Following the acquisition of Rohm and Haas, Dow is the most leveraged to the economic recovery, both operationally and financially, of any company in our coverage universe. On our estimates, between 2009 and 2012, 10% revenue CAGR is leveraged into 22% EBITDA CAGR and 83% EPS CAGR. Dow trades on 2011e P/E and EV/EBITDA multiples of 11x and 5.7x, respectively, which are 20% discounts to the US chemicals industry average.

BASF

We rate BASF Overweight. Our new price target is €60 (up from €58), as we have raised medium-term adjusted EPS by ~5% as a result of our more optimistic view of the sustainability of margins in chemicals and plastics. On our estimates, ~32% of sales, 36% of EBIT, and >40% of ModelWare EPS are derived from the group's chemicals and plastics divisions, the main businesses in BASF's portfolio that we believe will be affected by the analysis in this report. However, unlike SABIC in the Middle East and LyondellBasell in the US, BASF does not sell upstream petrochemical products to external customers. On balance, BASF is short most of the primary petrochemical products, and thus should be seen as an integrated downstream player, rather than a commodity chemical company per se. However, this definition of the company is not captured in valuation, with BASF trading at less than 10x PE in 2011e. This is too low, in our view, for a company that delivered a doubling in trough returns in 2009 (vs. 1993 and 2001 troughs), and that has executed on a meaningful transformation of its portfolio away from upstream assets, and toward specialty chemicals.

Formosa Plastics

We rate Formosa Plastics Overweight. It is our top pick among Taiwan chemicals. We like FPC because of its strong specialty chemicals performance. FPC's operating profit margin of specialty chemical improved from 7% in 2009 to 32% in 2010 YTD. Little new capacity was added globally for these specialty chemicals given the financial crisis in 2008–09. Hence, we believe robust demand and tight supply in the end market for AA/AE (paint solvent), AN (ABS), and MMA (LED light guide plates) should continue to support FPC's margin. In addition, we hold a positive view of the long-term prospects for ethylene-based PVC versus China's carbide-based PVC. Carbide PVC production is high-energy intensity. We believe carbide PVC production will lose its competitive edge in the light of efforts by the government of China to lower carbide emissions. We believe the reduced Chinese supply could support regional PVC prices, and FPC will be a

key beneficiary as Taiwan is the top PVC export country to China and FPC is the largest PVC producer in Taiwan.

LG Chem

We rate LG Chem Overweight. It is our top pick among the Korean chemical names. We estimate the company offers robust earnings growth of 22% for the next three years (2009–12 CAGR), backed by its well-diversified petrochemical business, fast-growing information & electronic materials (I&E) business, and high-potential auto battery business. We believe the stock's multiple is undergoing a rerating given the potential of LG Chem's new business ventures (i.e., auto battery, energy storage system, glass business). The stock is trading at 10x EPS and 2.4x P/B on our 2011 estimates, while offering the one of the highest ROEs among its peers, at 30%.

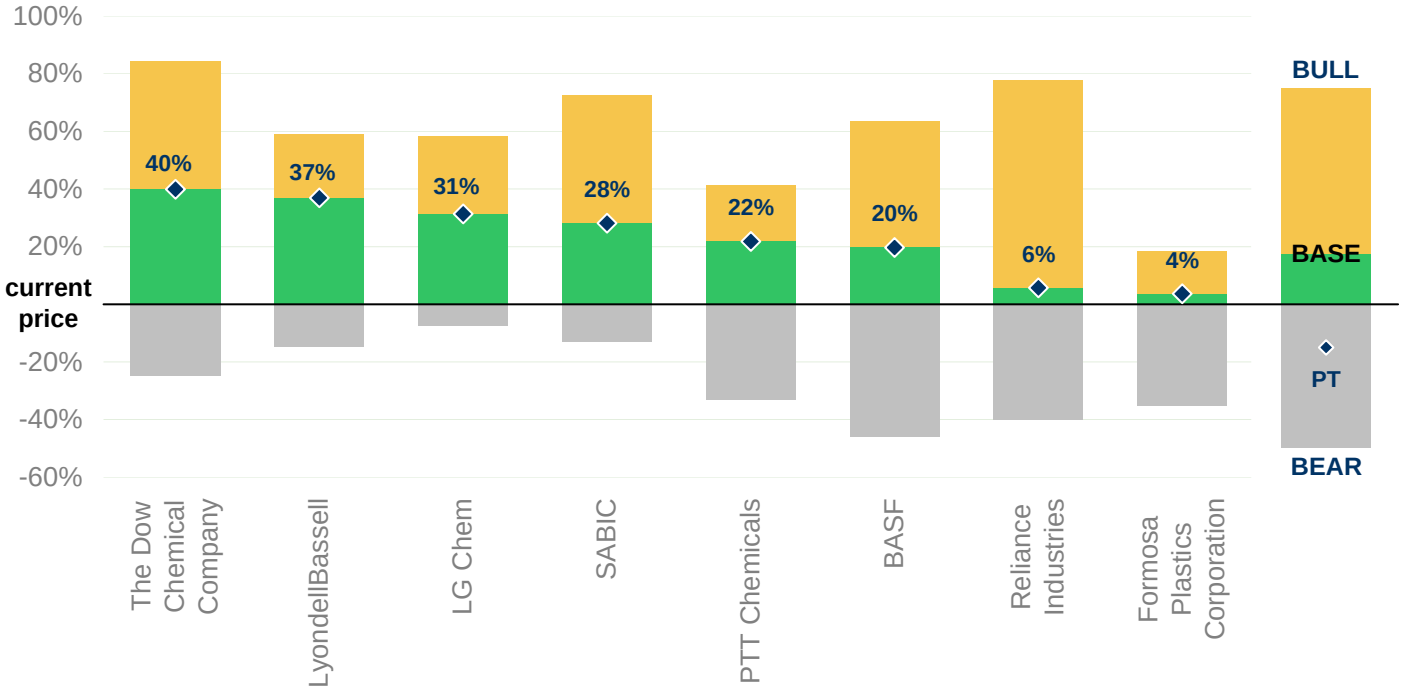
LG Chem operates the most diversified petrochemical facility in Korea. NCC/polyolefins and ABS/engineering plastics account for 30% each of chemical sales, followed by synthetic rubber/specialty polymers at 16%, and PVC and acrylate/plasticizers at 12% each. Among the company's commodity chemicals (NCC/polyolefin) sales, the high-grade portion accounts for 75%, which we believe will rise given management's focus on transitioning to premium-grade products. This provides LG Chem with relatively stable, higher margins against its naphtha-based competitors and helps protect margins during corrections.

We expect the company's I&E division to contribute ~30% of total sales and 26% of total operating income in 2010. Its product portfolio includes batteries (cylindrical, prismatic, polymer) and optical materials (polarizer films, photoresistors) and should show gradual earnings growth on capacity expansions and additional volume sales to key clients.

Recent excitement over hybrid and electric vehicles has put LG Chem's auto battery business in the limelight. The company has contracts with 8 global automakers, including GM, Ford, Volvo, and Hyundai Motors, with 2–3 additional contracts reportedly to be disclosed later in the year. While this business has yet to make a meaningful contribution to earnings, we believe it has significant growth potential over the next 2–3 years.

Exhibit 6

Focus Stocks: Comparative Risk-Reward



Source: FactSet, Morgan Stanley Research

Investment Debates

Debate 1: Ethylene Demand — Tepid or Robust?

Debate 1: How much will emerging markets contribute to ethylene demand growth?

Market's view: Ethylene demand is likely to be weak. During the last decade, Ethylene became a sub-GDP growth industry. Given the uncertainty regarding the recovery of the US and European economies, investors lack confidence in strong ethylene demand.

Our view: We are entering the strongest period of sustained ethylene demand growth seen in the past 20 years, driven by emerging markets. Developed economies are likely to have little impact.

The US and Europe Have Driven Ethylene Demand

From 1990 to 2000, global ethylene demand growth averaged 5.0%, or 1.9x global GDP growth. However, from 2000 to 2009, it averaged just 2.5%, or 0.9x global GDP growth.

Developed markets drove demand… In 2000,

- the US was the world's largest consumer of polyethylene, responsible for 24% of global consumption, or 45.4 kg/capita;
- developed Europe was the second-largest consumer, responsible for 23% of global consumption, or 24.7 kg/capita.

…but per capita DM demand has declined… Between 2000 and 2009, environmental measures, increased recycling, and the economic downturn caused US per capita consumption of polyethylene to decline by 27%, to 33 kg, equivalent to levels seen in 1991. While consumption in developed Europe grew steadily from 2000 to 2007, the region gave up those gains in 2008–09.

…and rising Chinese demand has thus far not offset declining DM demand. In 2009, China became the world's largest consumer of polyethylene. Chinese demand grew by 114% in 2000–09, from <7 million tons to 14 million tons, or from 5.4 to 11.0 kg/capita. However, increasing demand from China and other emerging markets has been insufficient to offset the declines witnessed in developed markets.

The Future Will Likely Look Very Different

In 2010, we estimate that China will consume 60% more polyethylene than the US and 26% more than developed Europe. We estimate per capita consumption in China will be only 12.7 kg; this is less than 30% of peak US consumption in 2000), suggesting significant potential upside for overall consumption.

Our base case: incremental demand in 2009–14 equivalent to current US consumption… We forecast that China and India will increase consumption at CAGRs of 8.8% and 12% respectively, equivalent to 0.9x and 1.3x GDP growth. On our estimates, this will result in an incremental 10.5 million tons of polyethylene consumption; equivalent to the current US consumption.

…but the US and Europe should have little impact on global demand over the next four years. Our base case — a 5.6% CAGR in global ethylene demand in 2009–14 (or 1.3x our economists' forecast of global GDP growth) — assumes a very modest rebound in per capita consumption in the US and Europe.

Our bear case — a 4% CAGR in global ethylene demand in 2009–14 — assumes that US demand continues to decline, with per capita consumption falling in line with the drop witnessed in 2004–07.

Where We Differ

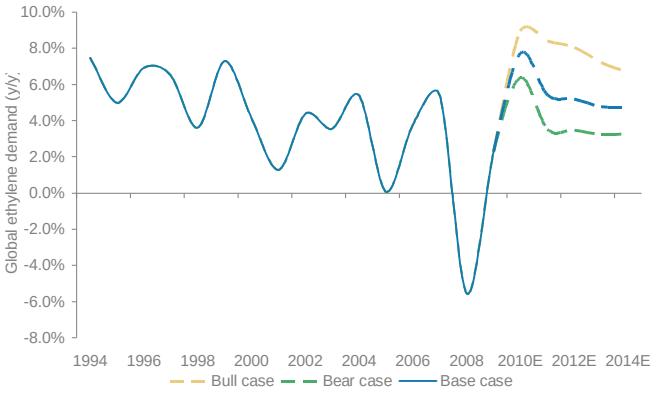
We think the market is focused too intently on a continued weak economic outlook and low global GDP growth. Ethylene demand growth has decoupled from global GDP growth, in our view, and will be increasingly driven by emerging markets, especially China and India.

Exhibit 7
Global Polyethylene Demand at a Glance

	2009	2010e	2011e	2012e	2009-14 %CAGR
Base case					
Kg Per-capita (y/y)	1.1%	7.5%	4.8%	4.3%	**5.0%**
GDP Elasticity	2.3x	1.9x	1.3x	1.2x	**1.5x**
Real GDP Growth	-0.9%	4.7%	4.2%	4.4%	**4.1%**
Bull case					
Kg Per-capita (y/y)	1.1%	8.9%	8.0%	7.3%	**7.3%**
GDP Elasticity	2.3x	1.9x	1.0x	0.9x	**1.7x**
Real GDP Growth	-0.9%	4.7%	5.4%	5.9%	**5.0%**
Bear case					
Kg Per-capita (y/y)	1.1%	5.9%	2.7%	2.5%	**3.3%**
GDP Elasticity	2.3x	1.9x	1.8x	1.8x	**1.4x**
Real GDP Growth	-0.9%	4.7%	3.0%	2.9%	**3.1%**

Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 8
Global Ethylene Demand Growth

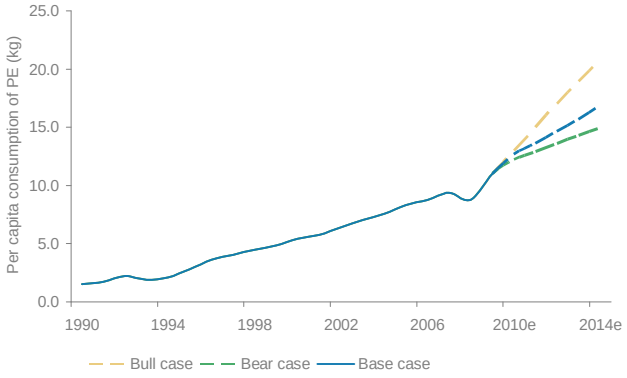


Source: Morgan Stanley Research, CMAI E = Morgan Stanley Research estimates

Exhibit 9
Global GDP Elasticity of Polyethylene Demand

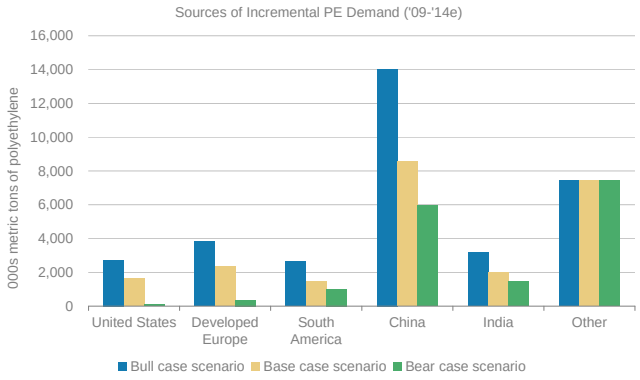
Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 10
China per Capita Polyethylene Consumption



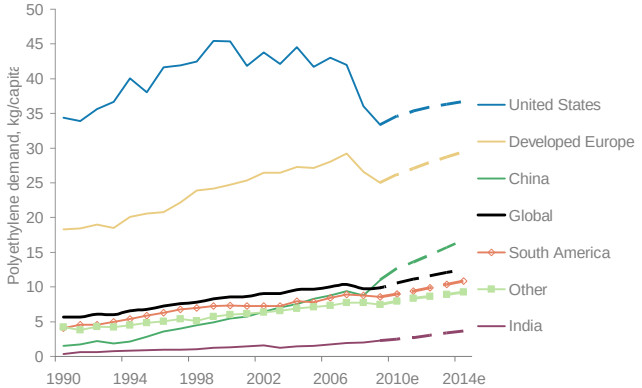
Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 11
China Is Largest Driver of Incremental PE Demand…



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 12
…but Still Has Far to Go vs. the Developed World



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Debate 2: Ethylene Supply, Near Term vs. Long Term

Debate 2: Will supply significantly exceed demand, and will utilization rates remain low for some time?

Market's view: Significant new capacity is coming online. Further, ethylene utilization rates are set to fall significantly and to remain below 90% until 2014, dragging down industry profitability. CMAI, which generally informs consensus, expects utilization rates to decline to 82% in 2011. This suggests limited pricing power for petrochemical producers over the next cycle.

Our view: Much of the anticipated new capacity has already come online, and global utilization rates should reach all-time highs above 90% by 2013. We expect utilization rates to moderate in late 2010 and 1Q11 before tightening through the balance of 2011. On a full-year average basis, we expect utilization rates to tighten to 85% in 2011.

Utilization Should Tighten Faster Than Expected

Utilization rates are currently close to 84.5%, or 250 basis points better than the 82% suggested by CMAI. During the past nine months, utilization rates have actually tightened, despite significant capacity increases, driven by strong emerging markets demand and a modest economic recovery in developed markets.

We see limited incremental capacity coming online near term… Approximately 55% of expected new capacity from 2010-11 is already operational, suggesting there is just 6 million tons of new capacity to enter the market in the balance of 2010 and 2011. On a monthly basis, we expect capacity to grow from 11.9 million tons/month in September 2010 to 12.1 million tons in December 2010 and 12.5 million tons in December 2011, an increase of 1.6% quarter-over-quarter in 4Q10 and 3.3% year-over-year in 2011.

…and expect expansions to average just 2% in 2011–14. Due to a diminishing availability of cheap ethane gas, the Middle East should find it more difficult to add low-cost ethylene capacity. As for areas that might have advantaged feedstock (e.g., near the Marcellus shale), long lead times for new world-scale facilities (3–5 years) give us confidence that new capacity will be limited in the medium term.

Thus, we expect utilization rates to moderate from their current levels in 4Q10 and 1Q11 before tightening through the balance of 2011. On a full-year average basis, we expect utilization rates to tighten by 100 basis points over the next 12 months, from 85% in 2010 to 86% in 2011.

Our base case: global capacity utilization rates reach 88% in 2012 and 92% in 2014, near all-time highs. (Global utilization rates averaged 89% between 1990 and 2009.)

And we feel there is significant upside to this utilization forecast given:

- the likelihood of unplanned outages at older facilities;
- possible shutdowns at older, smaller, non-economic facilities in Europe and/or Asia; and
- low expectations for economic growth over the next 3–5 years.

Improvement even in our bear case. Also, even in our bear case scenario, where global GDP growth averages just 3% (based on our economists' forecasts) and ethylene demand falls to just 1.1x GDP, we still forecast capacity utilization improving in 2H11, as our favorable view of Middle Eastern and North American ethylene producers is unchanged (albeit with lower polyethylene prices and margins).

Where We Differ

Our outlook for higher-than-expected utilization rates is driven by:

- our view of strong demand from emerging markets (see Debate 1) and
- our view that consensus does not fully appreciate how little additional capacity is set to come online over the next four years. Some 17.5 million tons of production capacity (a 10% supply increase) is entering the global market in 2010–11e, but we think the market is overly focused on the total number, rather than the amount left to be added.

Exhibit 13

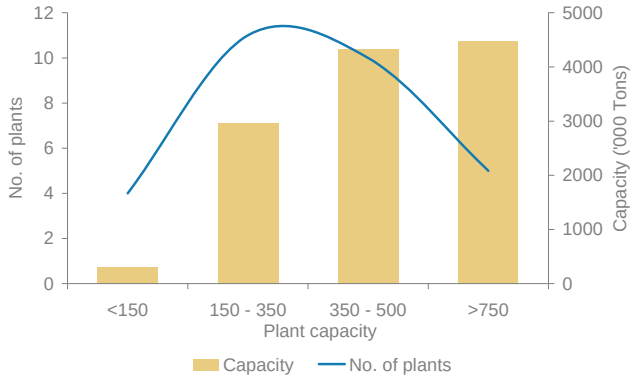
Post-2011e Supply Growth Limited by Financial Crisis

Ethylene, '000 tons/year	2010e	2011e	2012e	2013e	2014e
Middle East	5,800	1,325	1,658	-	1,500
China	4,450	60	1,600	2,000	750
India	1,107	-	-	1,300	-
Southeast Asia	800	2,900	-	-	-
Other	1,100	-	-	600	420
Total new capacity	13,257	4,285	3,258	3,900	2,670
Capacity growth	10.0%	3.0%	2.2%	2.6%	1.7%
Demand growth					
Bull case	9.0%	8.4%	8.0%	7.2%	6.7%
Base case	7.7%	5.4%	5.2%	4.8%	4.8%
Bear case	6.4%	3.5%	3.5%	3.2%	3.3%

Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 14

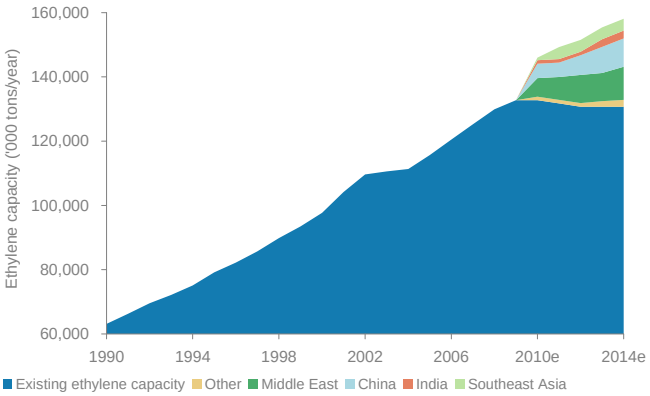
Many Older European Facilities Are Likely Too Small to Survive the Next Cycle…



Source: Morgan Stanley Research, CMAI

Exhibit 15

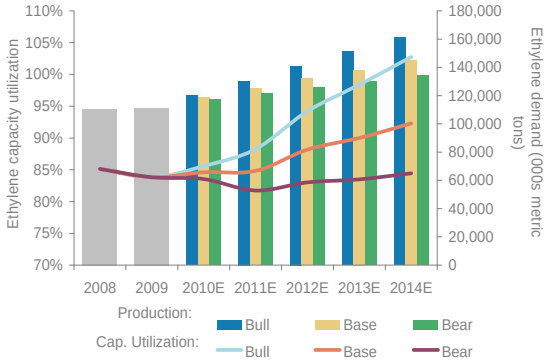
…Which Means Shutdowns Will Likely Offset Some New Capacity Growth



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 16

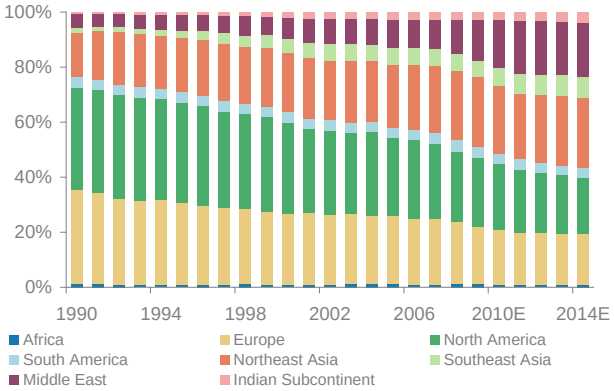
Ethylene Utilization Set to Increase



Source: Morgan Stanley Research, CMAI E = Morgan Stanley Research estimates

Exhibit 17

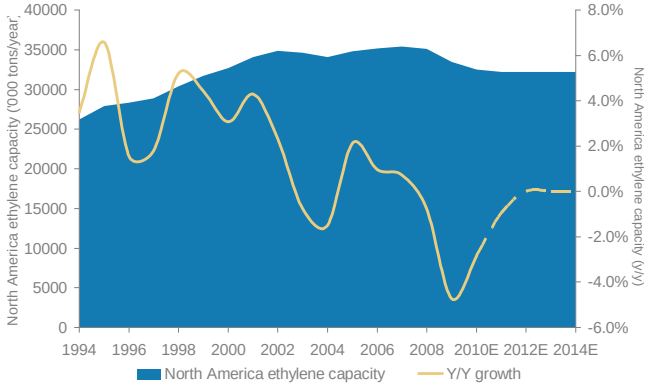
Asia and Middle East Likely to Reach 50% of Global Production in 2010



Source: Morgan Stanley Research, CMAI E = Morgan Stanley Research estimates

Exhibit 18

US Capacity Growth Appears Particularly Benign



Source: Morgan Stanley Research, CMAI E = Morgan Stanley Research estimates

Debate 3: Petrochemical Margins, Focus on Feedstocks

Debate 3: Have US petrochemicals margins peaked?

Market's view: Margins have peaked for this cycle and are set to decline. US integrated polyethylene margins at $685/metric ton ($0.31/lb) are 2.7x the average of the past 10 years. On an annualized basis, CMAI's forecast (upon which consensus is based) is that US integrated polyethylene margins will decline from $526/ton in 2010to $338/ton in 2012, before rising to $440/ton in 2014, still some 17% below the current level.

Our view: Consensus is too bearish on both US input costs (i.e., ethane) and global selling prices (which are based on crude oil). Our base case 2012 profit forecasts for US producers are 184% above consensus, on average.

Where We Differ

We see significant upside risk to the consensus margin outlook for US ethylene and polyethylene based on our differing views of input costs and global selling prices.

Input costs (ethane prices)
CMAI forecasts that US ethane prices will decline from $0.58/gallon in 2010 to $0.56/gallon in 2011, and then steadily rise to $0.69/gallon in 2012 and $0.79/gallon by 2014.

We disagree with CMAI's ethane assumption on two points:

- *Natural gas price — the effective floor for ethane prices — should be lower than consensus expects*. CMAI assumes natural gas increases to $7.49/mmbtu in 2014, a 32% premium to the current forward curve. This would raise the gas-implied floor for ethane prices by an equivalent amount.

Ethane will always trade somewhere between natural gas and crude oil (on a BTU basis). Its position relative to the two limits (the gas-implied floor and the oil-implied ceiling) depends upon supply and demand. Morgan Stanley commodities strategist Hussein Allidina forecasts natural gas prices at or below the forward curve long term.

- *Ethane margins should be lower than consensus expects*. CMAI's forecasts imply demand outstripping supply; we expect the opposite. CMAI assumes that the profit fractionators take to strip ethane from natural gas increases from $0.25/gallon in 2011 to $0.30/gallon in 2014. In our view, fractionators will not command higher margins because by 2012, with substantial fractionation capacity coming online on the US Gulf Coast and increasing supply of wet natural gas, ethane supply will significantly outstrip demand (which is broadly fixed).

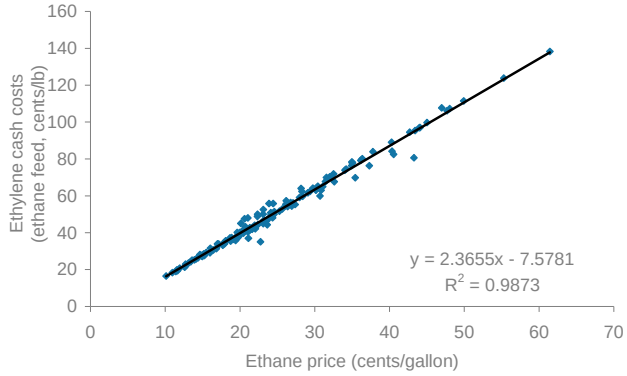
Prices
Polyethylene and ethylene prices are strongly correlated with two numbers that we believe CMAI underestimates:

- *Crude oil prices* (which in turn are strongly correlated to the input costs of the marginal producer). CMAI's forecasts assume an oil price 6% below the current forward curve. This suggests there is upside risk to petrochemical prices globally. Even though the US predominantly uses ethane as a feedstock, we expect the export opportunity to set US polyethylene prices (and ethylene derivative prices in general).

- *Global utilization rates.* As we detailed earlier (see Debate 2), utilization rates are close to 85%, or 300 basis points above the 82% suggested by CMAI. While we expect some near-term weakness in 4Q10 and 1Q11, we forecast global utilization rates reaching close to all-time highs by 2014.

Exhibit 19

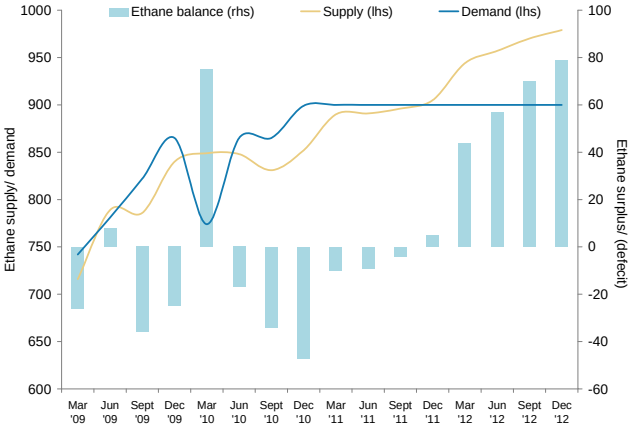
Ethane Is Key Cost for Light-Feed US-Based Ethylene Producers



Source: Morgan Stanley Research, CMAI

Exhibit 20

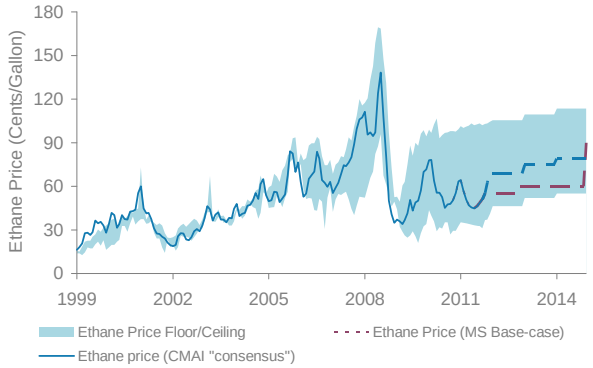
Ethane Set to Become Oversupplied from 2H11…
Increased fractionation capacity and wet gas production are the drivers



Source: Company data, Morgan Stanley Research estimates

Exhibit 21

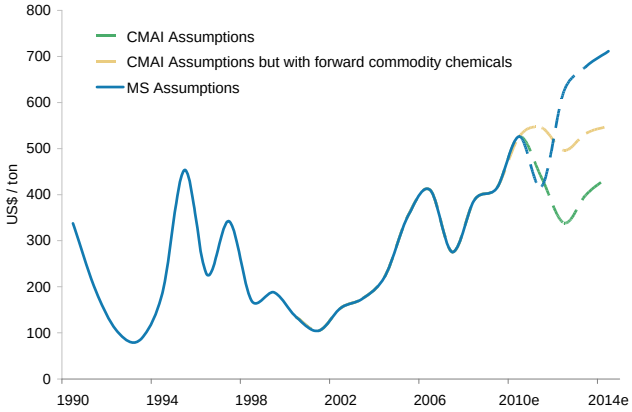
…so We Are LT Bearish View on US Ethane Price



Source: Morgan Stanley Research, CMAI

Exhibit 22

US Petrochemical Margins Will Be 2.4x the Average Achieved Between 1990 and 2009



Source: Company data, Morgan Stanley Research

Global Utilization

Global Ethylene Utilization Rates Set to Tighten

Global and regional capacity utilization is a key indicator of profitability in ethylene, as in many cyclical industries.

Tighter utilization rates drive our demand scenarios. We believe current utilization rates are close to 84.5%, or 250 basis points above the 82% suggested by industry consultant CMAI. This suggests utilization rates have tightened recently, despite significant capacity increases, driven by strong emerging markets demand and a modest economic recovery in developed markets. We expect these trends to continue.

Our supply forecasts, which are generally modest (just 2% growth in 2011–14e), rely on several key insights:

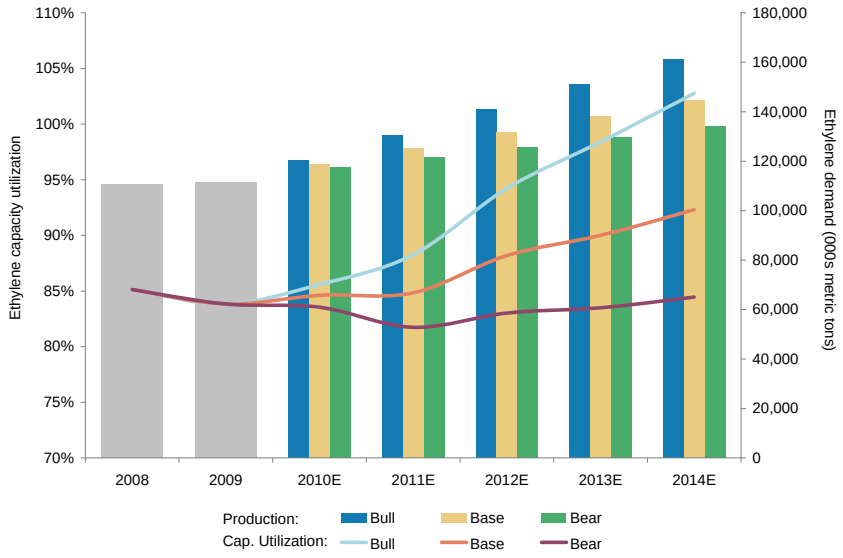
- Some 55% of expected new capacity for 2010–11 is operational, suggesting there is just 6 million tons of new capacity to enter the market through 2011.
- Many investors have been concerned about Middle Eastern capacity, with near-zero marginal cost, flooding the market with cheap ethylene derivatives. However, our research suggests that the Middle East is unlikely to expand production significantly as the region lacks additional natural gas feedstock.
- For areas that might have advantaged feedstock (e.g., near the Marcellus shale), long lead times for new world-scale facilities (3–5 years) give us confidence that new capacity will be limited in the medium term.

These conclusions form the basis of our supply/demand and capacity utilization scenarios (see Exhibits 23–26):

- *Base case: 90% utilization in 2013:* While we expect utilization rates to decline in late 2010/early 2011, we are confident they will rise throughout 2011, ending the year at or above the 2010 average. In our base case, utilization reaches 88% in 2012, 90% in 2013, and 92% in 2014, near all-time highs. Over the past 20 years, global utilization rates averaged 89%.
- *Bull case: 98% utilization in 2013.* Our bull case could be driven either by higher demand from Morgan Stanley economists' GDP forecasts or by the supply side. There is significant likelihood of unplanned outages at older facilities (we have already seen several this year), as well as the possibility of shutdowns at older, smaller, non-economic facilities in Europe and/or Asia and operational problems at new facilities.
- *Bear case: 84% utilization in 2013.* Even in our bear case scenario, where global GDP growth averages just 3% (based on our economists' forecasts) and ethylene demand falls to just 1.1x GDP, we still forecast capacity utilization improving in 2H11, as our favorable view of Middle Eastern and North American ethylene producers is unchanged (albeit with lower polyethylene prices and margins).

Exhibit 23

Ethylene Utilization Set to Increase from 2011 Onward, Even in Our Bear Case Scenario



Source: Morgan Stanley Research, CMA E = Morgan Stanley Research estimates

Exhibit 24

Base Case Ethylene Supply/Demand and Capacity Utilization

	2004	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E
Capacity											
Prior year capacity	110600	111334	115686	120474	125241	129911	132727	140547	148730	151498	155477
New Capacity	734	4352	4788	4767	4670	2816	7820	8184	2768	3979	3285
New Capacity as a % of Nameplate		3.9%	4.3%	4.1%	3.9%	2.2%	6.0%	6.2%	2.0%	2.7%	2.2%
Nameplate Capacity	111334	115686	120474	125241	129911	132727	140547	148730	151498	155477	158762
Hypo (Rationalized) Capacity	0	0	0	0	0	0	0	-1000	-2000	-2000	-2000
Total Capacity	**111334**	**115686**	**120474**	**125241**	**129911**	**132727**	**140547**	**147730**	**149498**	**153477**	**156762**
	1%	**4%**	**4%**	**4%**	**4%**	**2%**	**6%**	**5%**	**1%**	**3%**	**2%**
Oper. Rate	93%	91%	91%	91%	85%	84%	85%	85%	88%	90%	92%
Production	103906	105573	109198	114428	110583	111267	118918	125339	131836	138136	144703
Demand											
Alpha Olefins	3326	3322	3270	3483	3103	3048	3292	3555	3718	3674	3894
Ethylbenzene	7306	7275	7376	7843	7249	6962	7519	7797	8098	8348	8625
EDC	13087	13125	13260	13498	12555	12418	13287	13842	14462	14811	15161
Ethylene Oxide	13490	13746	14448	15539	14854	15066	16121	16918	17824	18883	19916
HDPE	27938	28174	29795	31808	30272	31985	32780	34723	36915	39222	41535
LDPE	17601	17571	17991	18469	17514	17687	19862	20665	21279	21941	22599
LLDPE	16055	16015	16961	17969	16923	17862	20285	21690	23186	24675	26175
Vinyl Acetate	1436	1354	1423	1489	1478	1353	1434	1503	1563	1636	1702
Others	4208	3945	3939	4199	3996	4016	4337	4646	4790	4945	5096
Demand	104446	104528	108463	114298	107948	110396	118918	125339	131836	138136	144703
Growth	5.4%	0.1%	3.8%	5.4%	-5.6%	2.3%	7.7%	5.4%	5.2%	4.8%	4.8%
Global GDP	3.9%	3.4%	4.0%	3.8%	2.8%	-0.9%	4.7%	4.2%	4.4%	4.1%	4.1%
Multipler	1.4x	0.0x	0.9x	1.4x	-2.0x	-2.5x	1.6x	1.3x	1.2x	1.2x	1.2x

Note: GDP Elasticity is calculated using Morgan Stanley Research bull case estimates for global GDP growth, published in "Global Economy in One Place" June 10, 2010
Source: Morgan Stanley Research, CMAI Global E = Morgan Stanley Research estimates

Exhibit 25

Bull Case for Ethylene Supply / Demand and Capacity Utilization Would See Production Maxed Out in 2014

	2004	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E
Capacity											
Prior year capacity	110600	111334	115686	120474	125241	129911	132727	140547	148730	151498	155477
New Capacity	734	4352	4788	4767	4670	2816	7820	8184	2768	3979	3285
New Capacity as a % of Nameplate		3.9%	4.3%	4.1%	3.9%	2.2%	6.0%	6.2%	2.0%	2.7%	2.2%
Nameplate Capacity	111334	115686	120474	125241	129911	132727	140547	148730	151498	155477	158762
Hypo (Rationalized) Capacity	0	0	0	0	0	0	0	-1000	-2000	-2000	-2000
Total Capacity	**111334**	**115686**	**120474**	**125241**	**129911**	**132727**	**140547**	**147730**	**149498**	**153477**	**156762**
	1%	**4%**	**4%**	**4%**	**4%**	**2%**	**6%**	**5%**	**1%**	**3%**	**2%**
Oper. Rate	93%	91%	91%	91%	85%	84%	86%	88%	94%	98%	103%
Production	103906	105573	109198	114428	110583	111267	120291	130393	140861	151017	161075
Demand											
Alpha Olefins	3326	3322	3270	3483	3103	3048	3322	3671	3931	3983	4320
Ethylbenzene	7306	7275	7376	7843	7249	6962	7589	8059	8572	9051	9577
EDC	13087	13125	13260	13498	12555	12418	13411	14307	15306	16057	16838
Ethylene Oxide	13490	13746	14448	15539	14854	15066	16271	17482	18856	20448	22078
HDPE	27938	28174	29795	31808	30272	31985	33211	36151	39374	42471	45665
LDPE	17601	17571	17991	18469	17514	17687	20111	21417	22591	23690	24687
LLDPE	16055	16015	16961	17969	16923	17862	20551	22953	25511	28187	30365
Vinyl Acetate	1436	1354	1423	1489	1478	1353	1448	1554	1654	1773	1889
Others	4208	3945	3939	4199	3996	4016	4377	4798	5067	5358	5656
Demand	104446	104528	108463	114298	107948	110396	120291	130393	140861	151017	161075
Growth	5.4%	0.1%	3.8%	5.4%	-5.6%	2.3%	9.0%	8.4%	8.0%	7.2%	6.7%
Global GDP							4.7%	5.4%	5.9%	5.0%	5.0%
Multipler							1.9x	1.6x	1.4x	1.4x	1.3x

Note: GDP Elasticity is calculated using Morgan Stanley Research bull case estimates for global GDP growth, published in "Global Economy in One Place" June 10, 2010
Source: Morgan Stanley Research, CMAI Global E = Morgan Stanley Research estimates

Exhibit 26

Bear Case Ethylene Supply / Demand Would See Very Low Operating Rates Before a Weak Recovery in 2012+

	2004	2005	2006	2007	2008	2009	2010E	2011E	2012E	2013E	2014E
Capacity											
Prior year capacity	110600	111334	115686	120474	125241	129911	132727	140547	148730	151498	155477
New Capacity	734	4352	4788	4767	4670	2816	7820	8184	2768	3979	3285
New Capacity as a % of Nameplate		3.9%	4.3%	4.1%	3.9%	2.2%	6.0%	6.2%	2.0%	2.7%	2.2%
Nameplate Capacity	111334	115686	120474	125241	129911	132727	140547	148730	151498	155477	158762
Hypo (Rationalized) Capacity	0	0	0	0	0	0	0	0	0	0	0
Total Capacity	**111334**	**115686**	**120474**	**125241**	**129911**	**132727**	**140547**	**148730**	**151498**	**155477**	**158762**
	1%	**4%**	**4%**	**4%**	**4%**	**2%**	**6%**	**6%**	**2%**	**3%**	**2%**
Oper. Rate	93%	91%	91%	91%	85%	84%	84%	82%	83%	84%	84%
Production	103906	105573	109198	114428	110583	111267	117425	121571	125780	129826	134089
Demand											
Alpha Olefins	3326	3322	3270	3483	3103	3048	3261	3473	3580	3484	3640
Ethylbenzene	7306	7275	7376	7843	7249	6962	7449	7613	7793	7917	8061
EDC	13087	13125	13260	13498	12555	12418	13163	13516	13918	14045	14166
Ethylene Oxide	13490	13746	14448	15539	14854	15066	15970	16520	17157	17919	18631
HDPE	27938	28174	29795	31808	30272	31985	32376	33738	35280	36889	38526
LDPE	17601	17571	17991	18469	17514	17687	19575	19868	20094	20412	20742
LLDPE	16055	16015	16961	17969	16923	17862	19912	20837	21842	22917	23968
Vinyl Acetate	1436	1354	1423	1489	1478	1353	1421	1468	1504	1552	1591
Others	4208	3945	3939	4199	3996	4016	4297	4538	4611	4691	4764
Demand	104446	104528	108463	114298	107948	110396	117425	121571	125780	129826	134089
Growth	5.4%	0.1%	3.8%	5.4%	-5.6%	2.3%	6.4%	3.5%	3.5%	3.2%	3.3%
Global GDP	4%	3%	4%	4%	3%	-1%	4.7%	3.0%	2.9%	3.0%	3.0%
Multipler							1.4x	1.2x	1.2x	1.1x	1.1x

Note: GDP Elasticity is calculated using Morgan Stanley Research bull case estimates for global GDP growth, published in "Global Economy in One Place" June 10, 2010
Source: Morgan Stanley Research, CMAI Global E = Morgan Stanley Research estimates

Demand

Ethylene Demand Driven by Emerging Markets Growth

We expect ethylene demand to be very strong in the next five years: Following an in-depth analysis of each ethylene end market, we assume in our base case a 5.6% CAGR in global ethylene demand in 2009–14, or 1.3x our economists' forecast of global GDP growth.

Slowdown in last decade driven by weak developed world economy and environmental awareness: From 1990 to 2000, global ethylene demand growth averaged 5.0%, or 1.9x global GDP growth. However, from 2000 to 2009, it averaged just 2.5%, or 0.9x global GDP growth. Even excluding years when the US was in recession, global consumption averaged only 3.5%. In 2000, the US was the world's largest consumer of polyethylene, but from 2000 to 2009, US per capita polyethylene consumption declined by 27%, from 44 kg to 33 kg. In developed Europe, consumption remained broadly flat.

Chinese demand has thus far not offset developed world weakness: In 2000, China consumed <7 million tons of polyethylene, one-quarter of the amount consumed by the US and developed Europe. While China's consumption more than doubled, to 14 million tons, by 2009, global growth remained weak due to the relatively small size of Chinese consumption relative to the US and Europe

China is now the world's largest consumer of polyethylene and ethylene derivatives: In 2010, we estimate that China will consume 60% more polyethylene than the US and 26% more than developed Europe. We estimate per capita consumption in China will be only 12.7 kg; this is less than 30% of peak US consumption in 2000, suggesting significant potential upside for overall consumption.

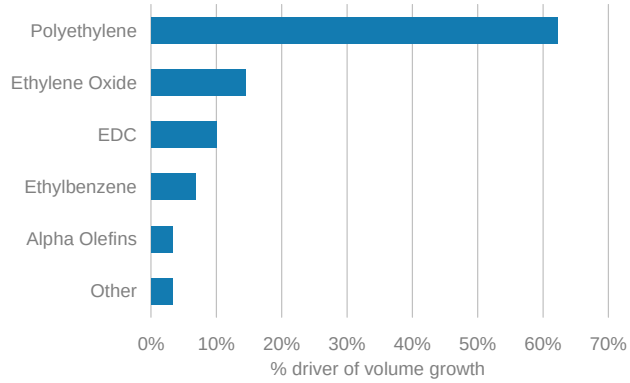
China and India to drive consumption to record level. Assuming Chinese demand growth of 0.9x GDP in 2011–14 (versus 1.1x in 2000–09) and Indian demand growth of 1.3x GDP (versus 1.4x), China and India combined will consume an additional 10.5 million tons of polyethylene, almost equivalent to the current US consumption.

The US and Europe should have little impact on global ethylene demand growth in the next four years. Even assuming zero recovery in polyethylene consumption in the developed world, global ethylene growth of 4% still appears likely, in our view, equivalent to 1.1x global GDP growth (based on our economists' forecasts).

Past Drivers of Ethylene Demand

In 1990–2000, polyethylene consumption (in containers, packaging, etc.) accounted for 62% of ethylene demand, with ethylene oxide (plastic beverage bottles) contributing 14% of growth.

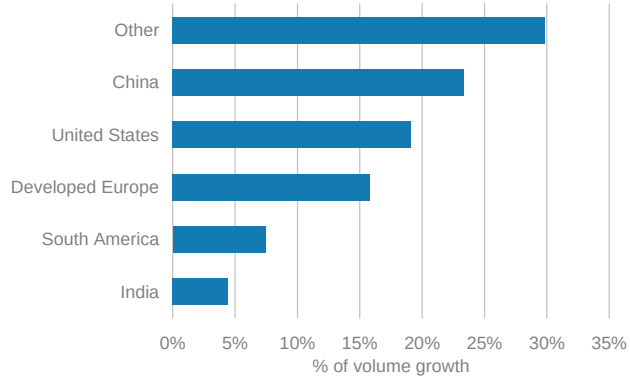
Exhibit 27
Drivers of Ethylene Volume Growth 1990–2000



Source: Company data, Morgan Stanley Research

In the same period, all regions contributed to the global growth of polyethylene, with China, the US, and developed Europe responsible for 60% of global demand growth.

Exhibit 28
Drivers of Polyethylene Volume Growth 1990–2000

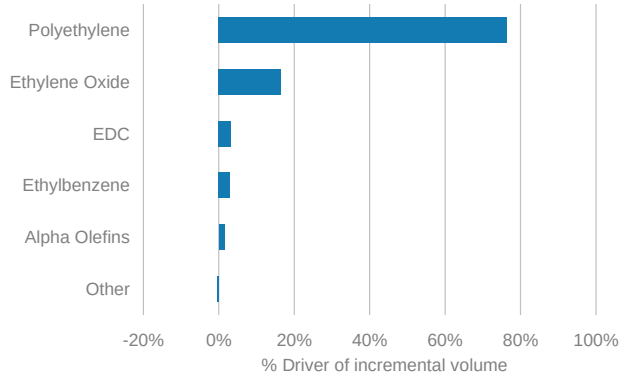


Source: Company data, Morgan Stanley Research

Two recessions in the developed economies in 2000–09 had a significant effect on consumption. Economic weakness, combined with increased environmental awareness driving recycling and less packaging, caused consumption to decline considerably in developed markets. Polyethylene was the key driver of demand growth during this period, and while the US and developed Europe were the largest consumers of ethylene derivatives, demand was driven entirely by emerging

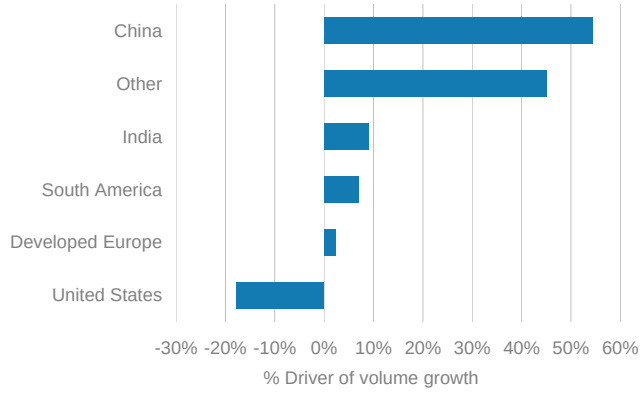
markets. In 2009, China became the world's largest consumer of polyethylene, consuming 44% more than the US and 14% more than developed Europe.

Exhibit 29
Drivers of Ethylene Volume Growth 2000–09



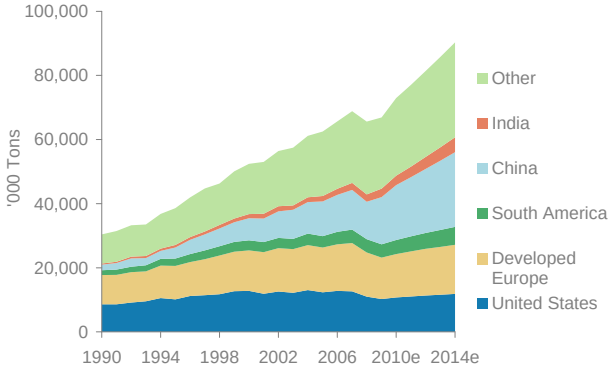
Source: Company data, Morgan Stanley Research

Exhibit 30
Drivers of Polyethylene Volume Growth 2000–09



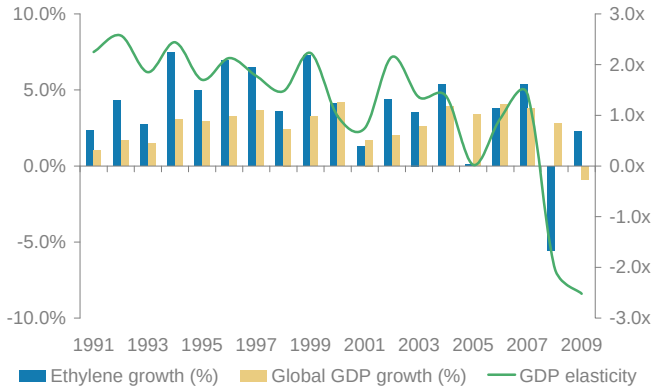
Source: Company data, Morgan Stanley Research

Exhibit 31
China Now the Largest Consumer of Polyethylene



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 32
Global Ethylene Demand 1990–2009



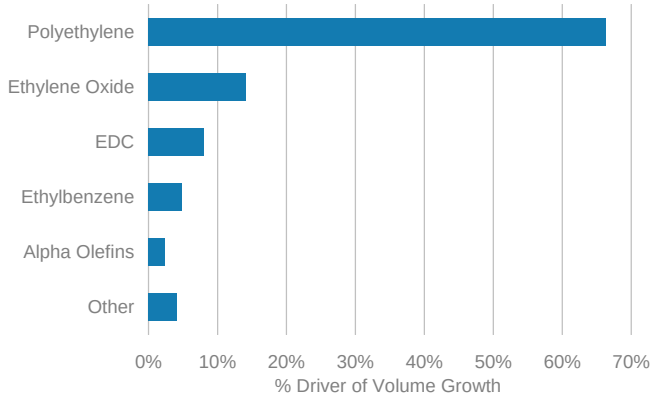
Source: Company data, Morgan Stanley Research

Drivers of Ethylene Demand Over the Next 5 Years

We expect polyethylene consumption to account for 66% of ethylene demand growth in 2009–14. Our base case forecast for polyethylene (PE) demand is for a 5.7% CAGR in 2009–14, driven by 1.5% global population growth and a 4.2% increase in per capita consumption. We expect most of the increased usage to come from emerging markets, where per capita consumption will likely trend toward developed market averages off a low base.

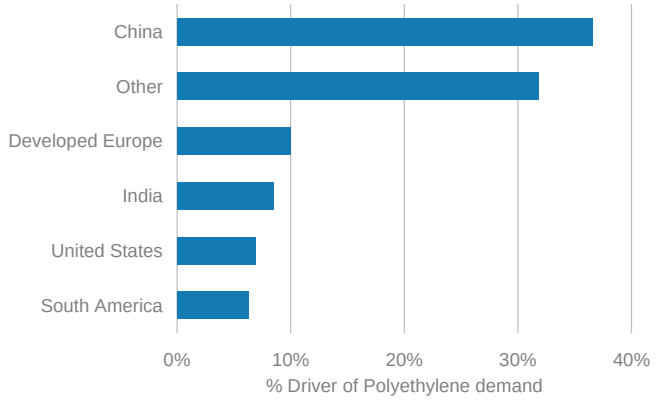
We expect this PE demand will lead to 5.6% elsewhere demand growth for ethylene, the feedstock for polyethylene and for which PE is the largest end use. On our estimates, emerging markets and other regions outside the US and developed Europe will account for 83% of polyethylene demand growth.

Exhibit 33
Drivers of Ethylene Demand 2009–14e



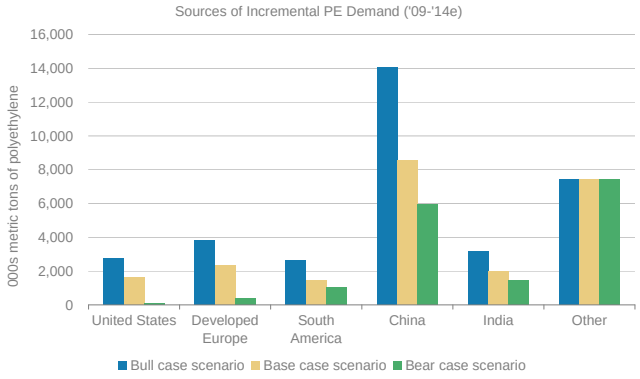
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 34
Drivers of Polyethylene Demand 2009–14e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 35
China Likely the Largest Driver of Global Growth

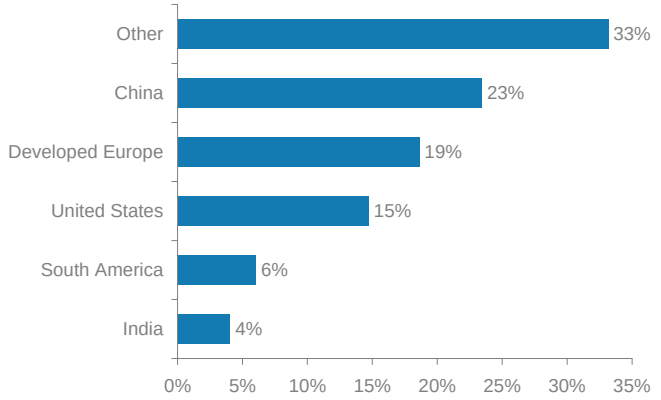


Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

China is already the world's largest consumer of polyethylene. A significant portion of China's consumption is used in manufacturing products that are then shipped back to developed markets. Still, we are confident that China's internal consumption of PE is also rising, and that the country will continue to increase its imports of basic plastics.

In 2010, we expect China to consume 60% more polyethylene than the US and 25% more than developed Europe; by 2014, those figures should rise to 100% and 50%, respectively. On our estimates, per capita consumption will still be less than 30% of the peak level of US consumption in 2000, suggesting upside potential.

Exhibit 36
Global Polyethylene Demand, 2010e

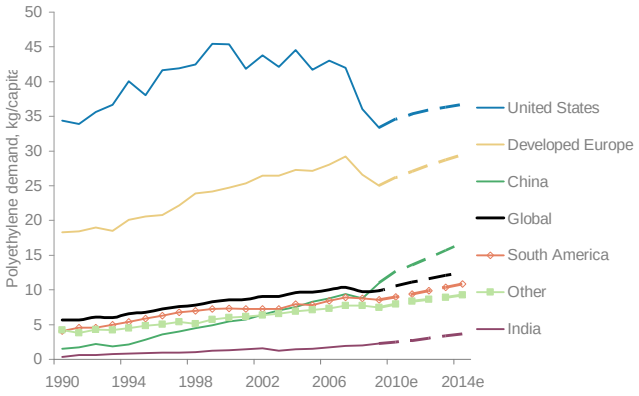


Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

PE usage in emerging markets is likely to converge with developed markets. Despite its position as the largest overall user of polyethylene, China's per capita consumption remains well below that of developed economies. Indeed, it was only in 2009 that China, for the first time, is estimated to have consumed more on a per capita basis than the global average.

- *Our base case: EM per capita consumption converges slowly with DM consumption.* Exhibit 37 illustrates our base case expectation — steady growth in per capita polyethylene consumption, in line with consensus.

Exhibit 37
Per Capita Consumption of PE, Base Case



Source: Morgan Stanley Research, CMAI Global e = Morgan Stanley Research estimates

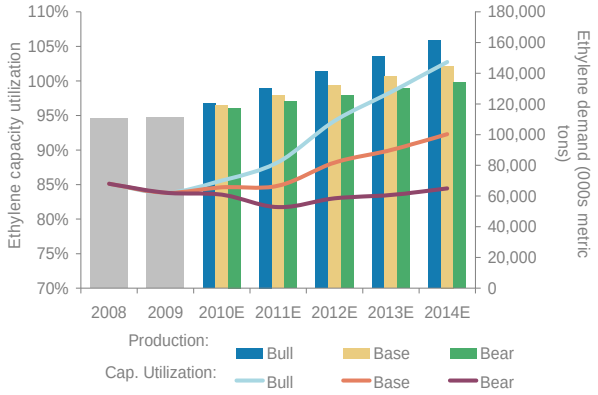
Our bull case and bear cases reflect demand scenarios that we expect if our economists' bear/bull cases prove correct. Our base case is favorable enough for us to be comfortable owning petrochemical producers with advantaged feedstock positions. The margin leverage that would result in our bull case drives upside to our outlook, and is likely not fully appreciated by the market.

- *Our bull case: EM per capita consumption converges quickly with DM consumption.* We believe there is a significant possibility that per capita consumption in emerging markets will grow much faster than in developed markets. Our bull case assumes an 8.1% CAGR in polyethylene demand in 2009–14, driving 6.5% annual growth in ethylene demand and 98% utilization rates by 2014.

- *Our bear case:* We assume 4.0% annual growth in PE demand over the same time period, driving 4.0% annual growth in ethylene demand and capacity utilization of 84% by year-end 2013.

Exhibit 38

Demand Growth and Capacity Utilization Forecasts



Source: Morgan Stanley Research, CMAI Global E = Morgan Stanley Research estimates

Polyethylene Demand Drives Our Global Petrochemicals Forecasts

China: By Far the Largest Driver of PE Demand

We expect significant growth in global polyethylene demand. In our base case, we conservatively expect overall PE demand to grow in line with GDP growth at 7–10% per year. Our bull case assumes growth of 1.3x GDP, in line with the 1990–2007 average.

The Chinese growth story underpins demand growth for polyethylene. Chinese demand for PE fell 6.4% in 2008. The resulting lower base provides an opportunity for significant growth through 2014, in our view, as demonstrated by 25% growth in 2009 and 15% growth in 2010e. China is now the world's largest consumer of PE, representing 23% of global demand, and its 2009–14e CAGR of 9.6% will likely drive 35–40% of global PE demand growth. Unlike the rest of the world, end-product distribution remains balanced. Blow molding, injection molding, film and sheet, and pipe and conduit each account for slightly more than 20% of the end product market.

Three Drivers of Chinese Growth, and PE Demand

Demographics: By 2015, people born after 1980 will represent 50% of China's population. This group will double the country's birth rate. They are accustomed to a higher standard of living, greater job security, and increased access to education. Wages should accelerate rapidly through 2020, while labor costs stall on a relative basis. Access to credit facilities should become less stringent. We expect this group to desire greater product substitutes, much like US baby boomers did in the 1960s, necessitating increased manufacturing to keep pace with consumer demand.

Urbanization: We expect urbanization to remain China's main growth driver for the next 10 years. The urbanization ratio is expected to climb from 47% to 63% over the next decade, attributable in part to the government's household registration reform, which gives migrant workers access to pensions, education, and other benefits when they relocate from rural to urban areas. Greater urbanization requires more construction, and more polyethylene consumption.

Industrial upgrades: Only 3% of China's workforce held college degrees in 1990. Today, that number is 10%, and we expect it to be 35% by 2020. There is a clear correlation between education and the overall manufacturing economy — a good proxy for PE consumption.

Exhibit 39

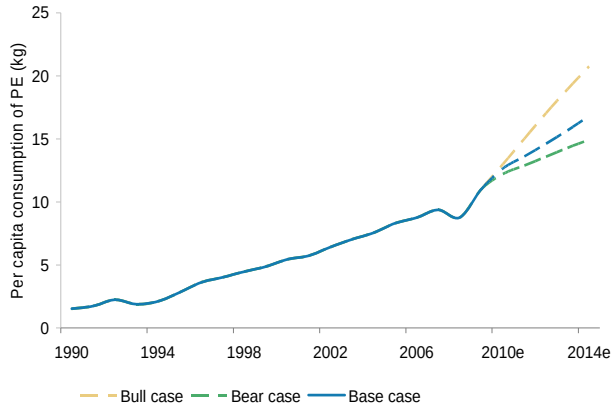
China PE Forecasts at a Glance

	2009	2010e	2011e	2012e	2009-14 %CAGR
Base case					
Kg Per-capita (y/y)	12.1%	10.8%	8.7%	12.3%	**10.3%**
GDP Elasticity	1.6x	1.4x	1.3x	1.5x	**1.1x**
Real GDP Growth	6.7%	8.5%	8.7%	9.0%	**10.5%**
Bull case					
Kg Per-capita (y/y)	12.1%	14.0%	18.0%	19.9%	**15.5%**
GDP Elasticity	1.6x	1.8x	2.4x	2.3x	**1.5x**
Real GDP Growth	6.7%	8.5%	9.8%	10.3%	**11.6%**
Bear case					
Kg Per-capita (y/y)	12.1%	8.2%	6.1%	8.4%	**7.6%**
GDP Elasticity	1.6x	1.1x	1.0x	1.0x	**1.0x**
Real GDP Growth	6.7%	8.5%	7.7%	7.8%	**9.2%**

Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 40

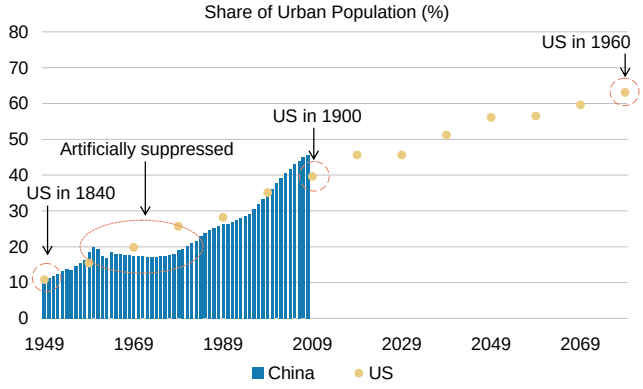
Chinese per Capita Consumption of Polyethylene



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 41

China Urbanization on Pace with US Industrial Revolution



Source: Morgan Stanley Research estimates, CMAI

India: Fast Grower, but Off a Low Base

India has perhaps the most long-term upside for PE demand growth of any country, due to its large population and current per capita consumption of just 2.5 kilos. While this is 5x the level recorded in 1990, it remains just 24% of the global average — and only 7% of US per capita consumption. This low base is what allowed Indian consumption to grow throughout the global recession: In 2009, PE demand in India grew 12.1% to its highest level ever, and we expect demand to grow another 11% in 2010.

We view India as being similar to China…

- Per capita consumption in India continues to rise at an accelerating rate, and we expect this to continue in all of our scenarios (see Exhibit 43).
- Consumption of polyethylene should grow faster than GDP, in line with China's experience (our base case is 1.5x GDP), but likely below the 2x rate experienced over the last 20 years (our bull case).

…but earlier in the process. Despite high expected growth rates, India's contribution to global demand growth is likely to remain small relative to China, at least in the medium term. We forecast 12% demand growth in our base case (2009–14 CAGR), versus 17% in our bull case, and 9% in our bear case.

Drivers of Sustainably Higher Consumption

In India, we see the combined effect of demographics, structural reforms, and globalization creating a virtuous cycle of job creation, income growth, savings, investments, and higher GDP growth.

We believe India's GDP growth will accelerate to a sustainable 9–10% by 2013–15, after an average of 7.3% over the past 10 years.

Growing middle class: China's integration with the global economy started in the early 1980s, while India's started in the 1990s. India is expected to add 136 million people to the global labor pool over the next 10 years, or 26% of the forecast increase in the global working-age population.

During a similar period in China's evolution, per capita consumption of polyethylene grew at an average annual rate of 17%.

Exhibit 42

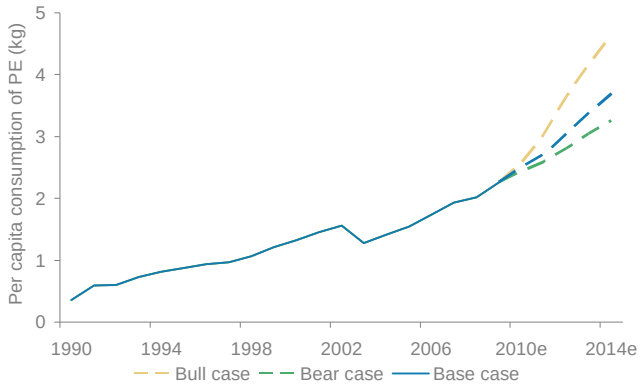
Indian PE Forecasts at a Glance

	2009	2010e	2011e	2012e	%CAGR
Base case					
Kg Per-capita (y/y)	12.1%	10.8%	8.7%	12.3%	**10.3%**
GDP Elasticity	1.6x	1.4x	1.3x	1.5x	**1.1x**
Real GDP Growth	6.7%	8.5%	8.7%	9.0%	**10.5%**
Bull case					
Kg Per-capita (y/y)	12.1%	14.0%	18.0%	19.9%	**15.5%**
GDP Elasticity	1.6x	1.8x	2.4x	2.3x	**1.5x**
Real GDP Growth	6.7%	8.5%	9.8%	10.3%	**11.6%**
Bear case					
Kg Per-capita (y/y)	12.1%	8.2%	6.1%	8.4%	**7.6%**
GDP Elasticity	1.6x	1.1x	1.0x	1.0x	**1.0x**
Real GDP Growth	6.7%	8.5%	7.7%	7.8%	**9.2%**

Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 43

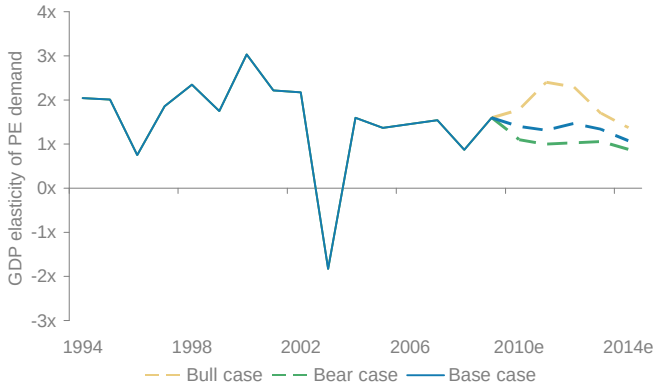
Indian per Capita Consumption of Polyethylene



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 44

Indian GDP Elasticity of PE Demand



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

US: Large PE Market, but Lacks Growth Potential

The US remains the second-largest source of global demand for PE, even though polyethylene demand in the US fell in 2009 to its lowest level in five years, to 10.2 million metric tons, or 33.3 kg per capita. We expect demand has rebounded by about 5% in 2010.

But the US is no longer the primary driver of global demand growth for PE. While we see several potential outcomes for demand in the US, at best, the US should be the fourth-largest growth driver, with China, India, Europe, and potentially South America all outpacing it.

- Base case: 3% annual US demand growth in 2009–14
- Bull case: 4.9%
- Bear case: 0.2%

Factors Driving Lower Consumption Played Out

We are not forecasting continued declines in per capita US consumption of PE in our base case. US per capita consumption has steadily declined since peaking in 1999. This can be attributed primarily to three factors, all of which we expect will slow, allowing PE demand growth to return to ~1x GDP growth. (That said, our bear case reflects continued negative GDP elasticity.)

Better efficiency: As prices and volatility increased over the past decade, manufacturers discovered more efficient designs that allowed them to use less volume in production (e.g., plastic bottles with thinner walls). We expect the negative demand from design efficiency to slow over the next cycle (i.e., the low-hanging fruit has been picked).

Legislation: Over the past 10 years, nine states (including California and New York) have passed legislation aimed at reducing plastic consumption to relieve stress in municipal waste disposal and/or for other environmental reasons. Of the other states that may take such measures, only Texas would likely be large enough to affect demand; we view incremental risk from legislation as low in the medium term.

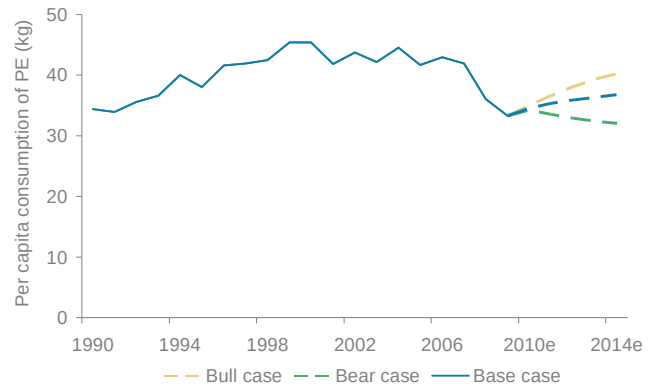
Recycling: Demand for recycled product has outpaced state mandates over the past decade. However, growth in PE recycling has slowed significantly in recent years due to a bottleneck in the high-cost collection process, as well as quality difficulties that arise when recycled PE becomes a meaningful percentage of the overall volume. For these reasons, we do not expect negative demand for new production as a result of recycling.

Exhibit 45
US PE Forecasts at a Glance

	2009	2010e	2011e	2012e	2009-14 %CAGR
Base case					
Kg Per-capita (y/y)	-7.6%	3.8%	2.1%	1.6%	**2.0%**
GDP Elasticity	2.6x	1.8x	1.2x	0.8x	**1.5x**
Real GDP Growth	-2.6%	2.7%	2.7%	3.2%	**2.0%**
Bull case					
Kg Per-capita (y/y)	-7.6%	4.8%	4.8%	4.1%	**3.8%**
GDP Elasticity	2.6x	2.2x	1.5x	1.0x	**1.7x**
Real GDP Growth	-2.6%	2.7%	3.9%	4.8%	**2.9%**
Bear case					
Kg Per-capita (y/y)	-7.6%	2.8%	-2.0%	-1.9%	**-0.8%**
GDP Elasticity	2.6x	1.4x	-0.7x	-0.6x	**0.1x**
Real GDP Growth	-2.6%	2.7%	1.4%	1.6%	**1.4%**

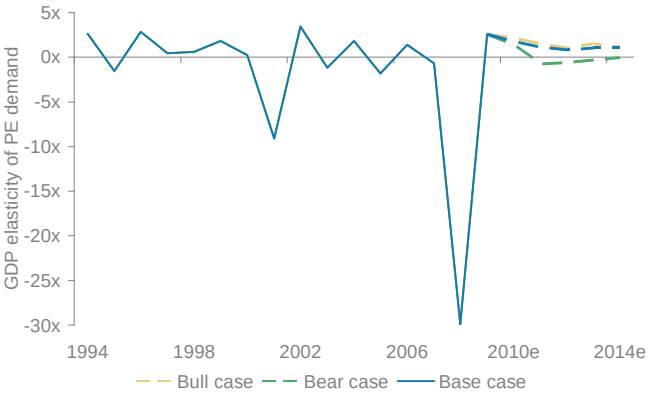
Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 46
US per Capita Consumption of Polyethylene



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 47
US GDP Elasticity of PE Demand



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Europe: Slower Growth, but Significant Size

Europe is a distant second as driver of global PE demand growth. European PE growth has accelerated following the recession, due to a stronger-than-expected recovery. Unlike the US, where per capita consumption peaked in 1999, Europe's utilization has trended upward, and we believe it will continue to rise toward parity with the US at 35 kg/capita. This translates to a 3.3% CAGR in per capita consumption through 2014. Unlike other regions, Europe's low population growth rate means that higher utilization represents virtually all of the demand growth in the region.

The stronger recovery and higher utilization means that we expect Europe to be the second-largest driver of global growth in PE demand in 2009–14e, although it is a distant second to China.

Bear Case More Likely Than Bull Case

Base case: mediocre GDP growth, but faster PE demand growth, slightly higher than historical trends. While we believe our forecasts in emerging regions are generally conservative, we acknowledge that, with the fiscal and economic uncertainty in Europe, we should assign a higher probability to our bear case: in this scenario, we reflect demand declining at a modest rate following the 2010 rebound.

Bear case would not undermine positive call on global polyethylene demand. Even if our bear case scenario for Europe plays out, it would not change our outlook for global PE demand, given the strength we expect from China, India, and other emerging regions.

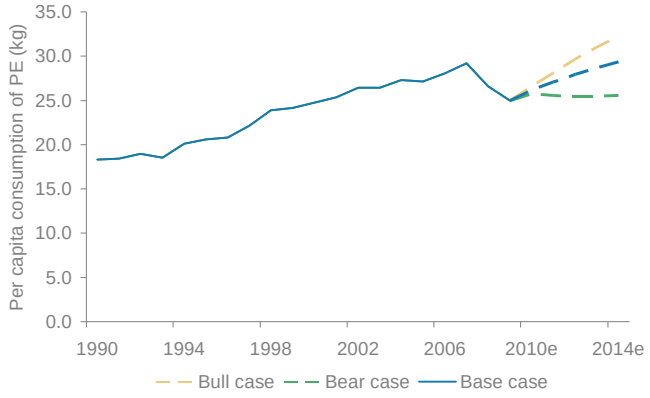
Further impact of REACH law likely limited. Some investors may be concerned that the Registration, Evaluation, Authorization, and Restriction of Chemicals (REACH) legislation has increased scrutiny over PE in Europe, and could limit growth. While this may be the case, the law has now been in place for three years, and we have likely seen most of its impact on the industry already. Further, the law is aimed primarily at more chemicals that are more complex and/or pose a health threat, neither of which is true of polyethylene.

Exhibit 48
Eurozone PE Forecasts at a Glance

	2009	2010e	2011e	2012e	2009-14 %CAGR
Base case					
Kg Per-capita (y/y)	-6.1%	4.7%	3.7%	3.1%	**3.3%**
GDP Elasticity	1.5x	2.8x	2.7x	1.9x	**4.1x**
Real GDP Growth	-4.1%	1.7%	1.4%	1.7%	**0.8%**
Bull case					
Kg Per-capita (y/y)	-6.1%	6.4%	5.6%	5.6%	**5.2%**
GDP Elasticity	1.5x	3.8x	2.5x	2.1x	**3.5x**
Real GDP Growth	-4.1%	1.7%	2.3%	2.7%	**1.5%**
Bear case					
Kg Per-capita (y/y)	-6.1%	2.9%	-0.5%	-0.4%	**0.5%**
GDP Elasticity	1.5x	1.8x	-0.8x	-1.2x	**14.5x**
Real GDP Growth	-4.1%	1.7%	0.5%	0.2%	**0.0%**

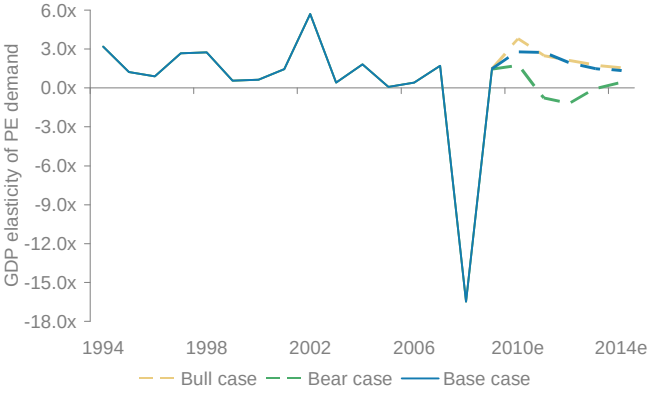
Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 49
Europe per Capita Consumption of Polyethylene



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 50
Europe GDP Elasticity of PE Demand



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

South America: Brazil Drives Demand Growth

South America could potentially outpace the US as the fourth-largest driver of polyethylene demand growth. South American PE demand is poised for a strong recovery following a sharp fall-off in 2008. PE demand in the region has doubled since 1990, and we expect a strong 6.3% CAGR through 2014.

Brazil drives South American PE demand, and should remain a global force in petrochemicals for some time. With 100 million people, Brazil is responsible for 45–50% of the region's PE demand. No other country accounts for more than 12% of Latin American demand. Its government is particularly supportive of petrochemicals projects that enable lower classes workers to obtain employment.

Three Drivers of South American PE Demand

Increased capacity: A number of projects are coming online within the next few years. Perhaps the largest is the $8.4 billion Comperj facility in Rio de Janiero. It is expected that this facility will produce 400 k/mt of HDPE per year in Brazil. Elsewhere, particularly in Venezuela, several more projects are set to launch, and will likely spill over into Brazil due to its demand glut.

High per capita consumption: South America's per capita PE growth is third to China's and India's at a steady 4.9%. Due to low projected population growth — 0.7% CAGR through 2014, according to the United Nations — and increased PE plant investment, we can expect that ratio to continue its ascent.

Economic growth: Our economists expect the South American economy to continue to grow, unlike North America and Europe. Our base case assumes GDP growth of 4.1% annually for the next five years, with a 3% bear case. A 3% growth rate should be enough to sustain demand for the PE produced by new projects, particularly in Brazil. Our bull case — at 5% GDP growth — assumes steep increases in PE demand that would exceed GDP growth.

Exhibit 51

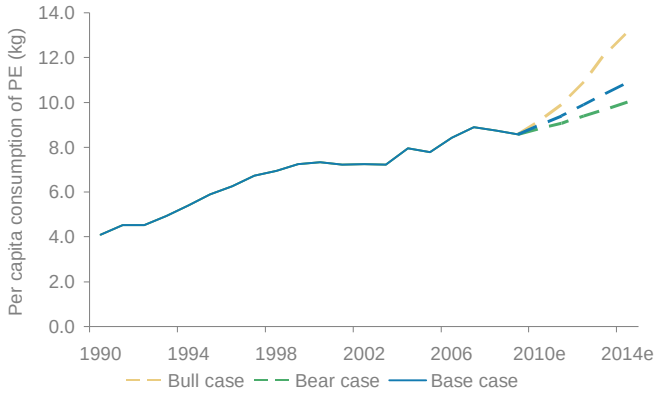
South American PE Forecasts at a Glance

	2009	2010e	2011e	2012e	2009-14 %CAGR
Base case					
Kg Per-capita (y/y)	-2.1%	4.8%	4.7%	5.1%	**4.9%**
GDP Elasticity	0.5x	1.0x	1.5x	1.5x	**1.5x**
Real GDP Growth	-2.0%	6.3%	4.1%	4.4%	**4.1%**
Bull case					
Kg Per-capita (y/y)	-2.1%	6.9%	8.2%	10.1%	**8.9%**
GDP Elasticity	0.5x	1.3x	1.8x	2.1x	**2.1x**
Real GDP Growth	-2.0%	6.3%	5.3%	5.4%	**5.0%**
Bear case					
Kg Per-capita (y/y)	-2.1%	3.0%	2.9%	3.5%	**3.2%**
GDP Elasticity	0.5x	0.7x	1.4x	1.6x	**1.4x**
Real GDP Growth	-2.0%	6.3%	2.9%	3.0%	**3.1%**

Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 52

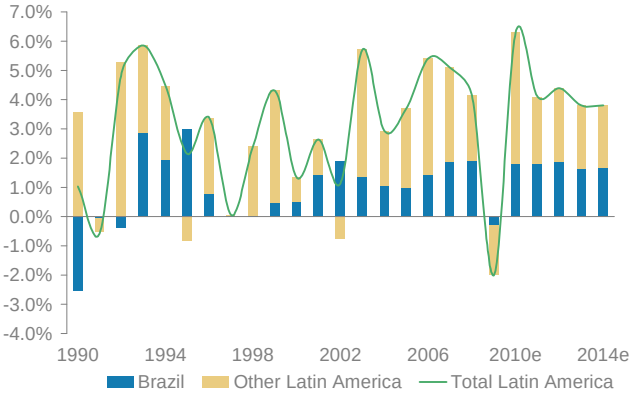
South America per Capita Consumption of PE



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 53

Brazil Represents Almost 50% of LatAm Growth



Source: Morgan Stanley Research, CMAI e = Morgan Stanley Research estimates

Exhibit 54

Base Case Polyethylene Demand Growth, In Line with Consensus

Regional Demand Breakdown (Base Case)	2008	2009	2010e	2011e	2012e	2013e	2014e	2009-14 %CAGR
United States	10,980	10,238	10,732	11,067	11,350	11,597	11,854	3.0%
Developed Europe	13,782	12,960	13,573	14,092	14,551	14,941	15,304	3.4%
South America	4,174	4,133	4,391	4,655	4,954	5,275	5,599	6.3%
China	11,658	14,733	17,079	18,474	19,981	21,598	23,297	9.6%
India	2,322	2,634	2,948	3,285	3,718	4,192	4,619	11.9%
Other	22,647	22,182	24,204	25,504	26,826	28,235	29,635	6.0%
Total Demand (000 metric tons)	**65,563**	**66,880**	**72,928**	**77,078**	**81,380**	**85,838**	**90,309**	6.2%
% growth	-4.8%	2.0%	9.0%	5.7%	5.6%	5.5%	5.2%	
United States	36.1	33.3	34.6	35.3	35.9	36.3	36.8	2.0%
Developed Europe	26.6	25.0	26.1	27.1	28.0	28.7	29.4	3.3%
South America	8.8	8.6	9.0	9.4	9.9	10.4	10.9	4.9%
China	8.8	11.0	12.7	13.6	14.6	15.7	16.8	8.8%
India	2.0	2.3	2.5	2.7	3.1	3.4	3.7	10.3%
Other	7.7	7.5	8.0	8.4	8.6	8.9	9.3	4.4%
Kg Per-capita	**9.8**	**9.9**	**10.6**	**11.1**	**11.6**	**12.1**	**12.6**	5.0%
United States	-14.0%	-7.6%	3.8%	2.1%	1.6%	1.1%	1.3%	
Developed Europe	-9.0%	-6.1%	4.7%	3.7%	3.1%	2.7%	2.4%	
South America	-1.5%	-2.1%	4.8%	4.7%	5.1%	5.0%	4.9%	
China	-6.4%	25.6%	15.0%	7.5%	7.4%	7.3%	7.2%	
India	4.3%	12.1%	10.8%	8.7%	12.3%	10.9%	8.9%	
Other	-0.5%	-3.1%	6.7%	4.9%	3.3%	3.5%	3.8%	
Kg Per-capita (% growth)	**-6.1%**	**1.1%**	**7.5%**	**4.8%**	**4.3%**	**4.1%**	**4.2%**	
United States	-29.9x	2.6x	1.8x	1.2x	0.8x	1.0x	1.1x	
Developed Europe	-16.5x	1.5x	2.8x	2.7x	1.9x	1.5x	1.4x	
South America	0.0x	0.5x	1.0x	1.5x	1.5x	1.7x	1.6x	
China	-0.6x	3.0x	1.6x	0.9x	0.9x	1.0x	1.0x	
India	0.9x	1.6x	1.4x	1.3x	1.5x	1.3x	1.1x	
GDP Elasticity (multiple of GDP growth)	**-1.7x**	**-2.2x**	**1.9x**	**1.4x**	**1.3x**	**1.3x**	**1.3x**	

Note: GDP Elasticity is calculated using Morgan Stanley Research bull case estimates for global GDP growth, published in "Global Economy in One Place" June 10, 2010
Source: Morgan Stanley Research, CMAI Global e = Morgan Stanley Research estimates

Exhibit 55

Bull Case Polyethylene Demand Growth Conservative Compared with Our Economists' Bull Case Scenarios

Regional Demand Breakdown (Bull case)	2008	2009	2010e	2011e	2012e	2013e	2014e	2009-14 %CAGR
United States	10,980	10,238	10,836	11,468	12,043	12,565	12,976	4.9%
Developed Europe	13,782	12,960	13,795	14,584	15,416	16,120	16,769	5.3%
South America	4,174	4,133	4,479	4,909	5,472	6,193	6,757	10.3%
China	11,658	14,733	17,525	20,387	23,286	26,088	28,764	14.3%
India	2,322	2,634	3,034	3,669	4,432	5,147	5,816	17.2%
Other	22,647	22,182	24,204	25,504	26,826	28,235	29,635	6.0%
Total Demand (000 metric tons)	**65,563**	**66,880**	**73,872**	**80,521**	**87,475**	**94,348**	**100,717**	8.5%
% growth	-4.8%	2.0%	10.5%	9.0%	8.6%	7.9%	6.8%	
United States	36.1	33.3	34.9	36.6	38.1	39.3	40.2	3.8%
Developed Europe	26.6	25.0	26.6	28.1	29.6	31.0	32.2	5.2%
South America	8.8	8.6	9.2	9.9	10.9	12.2	13.1	8.9%
China	8.8	11.0	13.0	15.0	17.0	18.9	20.8	13.5%
India	2.0	2.3	2.6	3.0	3.6	4.2	4.6	15.5%
Other	7.7	7.5	8.0	8.4	8.6	8.9	9.3	4.4%
Kg Per-capita	**9.8**	**9.9**	**10.7**	**11.6**	**12.4**	**13.2**	**14.0**	7.3%
United States	-14.0%	-7.6%	4.8%	4.8%	4.1%	3.2%	2.3%	
Developed Europe	-9.0%	-6.1%	6.4%	5.6%	5.6%	4.5%	4.0%	
South America	-1.5%	-2.1%	6.9%	8.2%	10.1%	11.6%	7.8%	
China	-6.4%	25.6%	18.0%	15.7%	13.5%	11.2%	9.5%	
India	4.3%	12.1%	14.0%	18.0%	19.9%	14.2%	11.7%	
Other	-0.5%	-3.1%	6.7%	4.9%	3.3%	3.5%	3.8%	
Kg Per-capita (% growth)	**-6.1%**	**1.1%**	**8.9%**	**8.0%**	**7.3%**	**6.4%**	**5.7%**	
United States	-29.9x	2.6x	2.2x	1.5x	1.0x	1.5x	1.1x	
Developed Europe	-16.5x	1.5x	3.8x	2.5x	2.1x	1.8x	1.6x	
South America	0.0x	0.5x	1.3x	1.8x	2.1x	2.6x	1.8x	
China	-0.6x	3.0x	1.9x	1.5x	1.3x	1.3x	1.1x	
India	0.9x	1.6x	1.8x	2.4x	2.3x	1.7x	1.4x	
GDP Elasticity (multiple of GDP growth)	**-1.7x**	**-2.2x**	**2.2x**	**1.7x**	**1.5x**	**1.6x**	**1.4x**	

Note: GDP Elasticity is calculated using Morgan Stanley Research bull case estimates for global GDP growth, published in "Global Economy in One Place" June 10, 2010
Source: Morgan Stanley Research, CMAI Global e = Morgan Stanley Research estimates

Exhibit 56

Bear Case Polyethylene Demand Growth Reflects Continued Declines in Developed Regions

Regional Demand Breakdown (Bear case)	2008	2009	2010e	2011e	2012e	2013e	2014e	2009-14 %CAGR
United States	10,980	10,238	10,629	10,519	10,414	10,348	10,341	0.2%
Developed Europe	13,782	12,960	13,348	13,296	13,264	13,256	13,318	0.5%
South America	4,174	4,133	4,317	4,498	4,713	4,933	5,156	4.5%
China	11,658	14,733	16,485	17,496	18,580	19,682	20,708	7.0%
India	2,322	2,634	2,879	3,130	3,420	3,764	4,078	9.1%
Other	22,647	22,182	24,204	25,504	26,826	28,235	29,635	6.0%
Total Demand (000 metric tons)	**65,563**	**66,880**	**71,863**	**74,443**	**77,216**	**80,218**	**83,235**	4.5%
% growth	-4.8%	2.0%	7.5%	3.6%	3.7%	3.9%	3.8%	
United States	36.1	33.3	34.3	33.6	32.9	32.4	32.1	-0.8%
Developed Europe	26.6	25.0	25.7	25.6	25.5	25.5	25.6	0.5%
South America	8.8	8.6	8.8	9.1	9.4	9.7	10.0	3.2%
China	8.8	11.0	12.2	12.9	13.6	14.3	14.9	6.3%
India	2.0	2.3	2.4	2.6	2.8	3.0	3.3	7.6%
Other	7.7	7.5	8.0	8.4	8.6	8.9	9.3	4.4%
Kg Per-capita	**9.8**	**9.9**	**10.4**	**10.7**	**11.0**	**11.3**	**11.6**	3.3%
United States	-14.0%	-7.6%	2.8%	-2.0%	-1.9%	-1.7%	-1.0%	
Developed Europe	-9.0%	-6.1%	2.9%	-0.5%	-0.4%	-0.1%	0.4%	
South America	-1.5%	-2.1%	3.0%	2.9%	3.5%	3.2%	3.3%	
China	-6.4%	25.6%	11.0%	5.5%	5.5%	5.1%	4.5%	
India	4.3%	12.1%	8.2%	6.1%	8.4%	8.2%	7.1%	
Other	-0.5%	-3.1%	6.7%	4.9%	3.3%	3.5%	3.8%	
Kg Per-capita (% growth)	**-6.1%**	**1.1%**	**5.9%**	**2.7%**	**2.5%**	**2.5%**	**2.8%**	
United States	-29.9x	2.6x	1.4x	-0.7x	-0.6x	-0.3x	0.0x	
Developed Europe	-16.5x	1.5x	1.8x	-0.8x	-1.2x	-0.1x	0.5x	
South America	0.0x	0.5x	0.7x	1.4x	1.6x	1.7x	1.6x	
China	-0.6x	3.0x	1.2x	0.8x	0.9x	1.0x	0.9x	
India	0.9x	1.6x	1.1x	1.0x	1.0x	1.1x	0.9x	
GDP Elasticity (multiple of GDP growth)	**-1.7x**	**-2.2x**	**1.6x**	**1.2x**	**1.3x**	**1.3x**	**1.3x**	

Note: GDP Elasticity is calculated using Morgan Stanley Research bull-case estimates for global GDP growth, published in "Global Economy in One Place" June 10, 2010
Source: Morgan Stanley Research, CMAI Global e = Morgan Stanley Research estimates

Other Ethylene Derivatives

Polyethylene represents 59% of ethylene end use, but 41% of ethylene is processed as other derivatives. Most of these derivatives are also commodity-type chemicals with a GDP-linked growth rates.

Exhibit 57
Global Ethylene Use

Major Ethylene Derivatives	World Ethylene Consumption	End Uses
Polyethylene	59%	Plastic film, containers, coatings
Ethylene Dichloride	12%	PVC films, coatings, pipes
Ethylene Oxide	14%	Antifreeze, polyester, detergents
Ethylbenzene	7%	Polystyrene packaging, ABS resins
Alpha Olefins	3%	Comonomers, lubes, detergents
Vinyl Acetate	1%	Adhesives,, packaging
Other	4%	Various applications

Source: CMAI, Morgan Stanley Research

Ethylbenzene and Styrene

Ethylbenzene represents 7% of ethylene production.

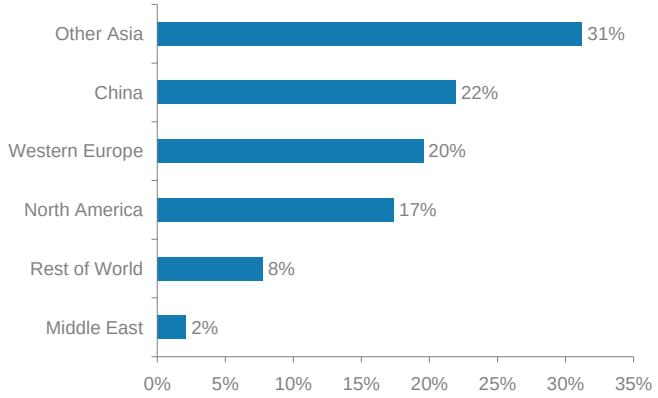
Nearly all ethylbenzene is used directly in the production of styrene, which is thus the key determinant of demand. Styrene is a colorless liquid, highly reactive but safe and easy to handle. It can be shipped in standard tank cars or trucks without special handling, though it requires a polymerization inhibitor to keep from forming a clear glassy solid.

Key uses: relatively low-cost plastics and synthetic rubbers used in a range of end markets (e.g., film, pipes, foam, paint, tires, and furniture) that are generally GDP exposed.

Derivatives of styrene:

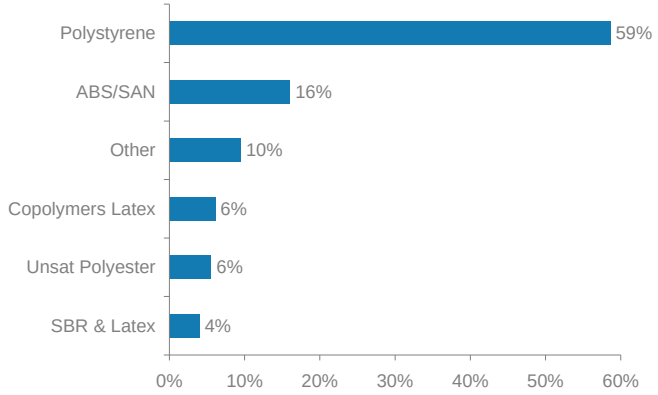
- *Polystyrene* accounts for 59% of global styrene consumption. The largest use of PS is packaging, accounting for ~40% of consumption, with the remainder used in construction, electronics, appliances, housewares, and sporting goods.
- *ABS* (acrylonitrile-butadiene-styrene) and *SAN* (styrene-acrylonitrile) resins together account for 16% of global styrene demand. ABS offers higher performance characteristics than commodity thermoplastics and is used in autos, electronics and piping. SAN has high clarity and heat resistance and are used in housewares, packaging, appliances and autos.
- *Styrene-butadiene copolymer latexes* (6% of demand) are used as carpet/upholstery backing and paper coatings.
- *Unsaturated polyester resins* (6% of global demand) are used fiberglass reinforced plastics for marine, construction and transportation.
- *SBR* elastomers (styrene-butadiene rubber) and latexes (4% of global demand) are synthetic rubbers used in car/truck tires, industrial hoses/belts and carpet backings.

Exhibit 58
Global Styrene Consumption by Region



Source: SRI, Company data, Morgan Stanley Research

Exhibit 59
Global Styrene Consumption by Product



Source: SRI, Company data, Morgan Stanley Research

Exhibit 60
Global Styrene Consumption ('000s of metric tons)

(k tons)	Polystyrene	ABS/SAN	Copolymers Latex	Unsat Polyester	SBR & Latex	Other
North America	2,561	358	311	288	203	389
Western Europe	2,826	311	616	266	160	441
Middle East	272	47	7	49	19	109
China	3,177	905	145	441	180	336
Other Asia	3,666	2,166	289	207	213	838
Rest of World	1,367	9	79	68	176	132
World	13,869	3,796	1,447	1,319	951	2,245
North America	62%	9%	8%	7%	5%	9%
Western Europe	61%	7%	13%	6%	3%	10%
Middle East	54%	9%	1%	10%	4%	22%
China	61%	17%	3%	9%	3%	6%
Other Asia	50%	29%	4%	3%	3%	11%
Rest of World	75%	0%	4%	4%	10%	7%
World	59%	16%	6%	6%	4%	10%

Source: Company data, Morgan Stanley Research

North America

We estimate that North America accounted for 17% of global styrene demand in 2009, making it the third-largest consumer. In North America, ~62% of styrene is used to produce polystyrene, with 5–9% used in each of the other applications.

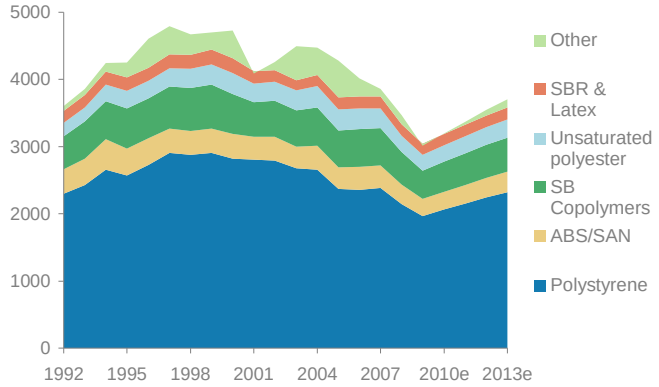
From 1980 to 2000, North American styrene consumption grew at around 3% per year, driven largely by polystyrene, with SBR consumption falling due to replacement by new products. Since 2000, consumption of styrene has fallen by 3.8% per year due to rising raw material prices and slowing domestic demand. Polystyrene demand has declined due to environmental concerns about its disposal, and increased competition from lower cost materials such as olefins while benzene prices have increased significantly. ABS has as seen substitution by PVC and polypropylene since its peak in the mid-1990s.

From 1997 to 2009, we estimate per capita consumption of styrene in North America fell from a peak of 17.6kg/capita to just 9.8kg/capita.

Our forecasts assume that North American per capita styrene consumption rises by 18% in 2009–13 (a 4.3% CAGR), to 11.6kg. That per capita growth would imply a 5.3% CAGR for overall consumption.

Exhibit 61

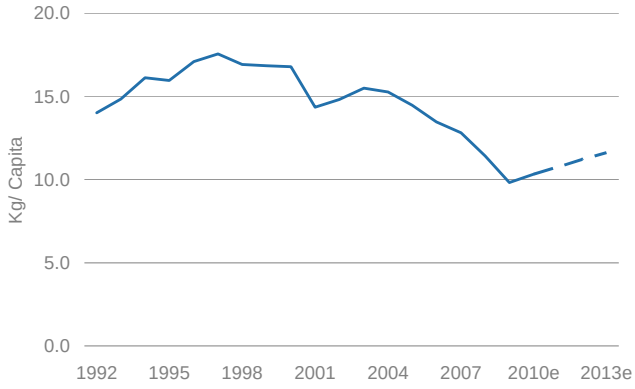
US Styrene Consumption by Product



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 62

US Styrene Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Western Europe

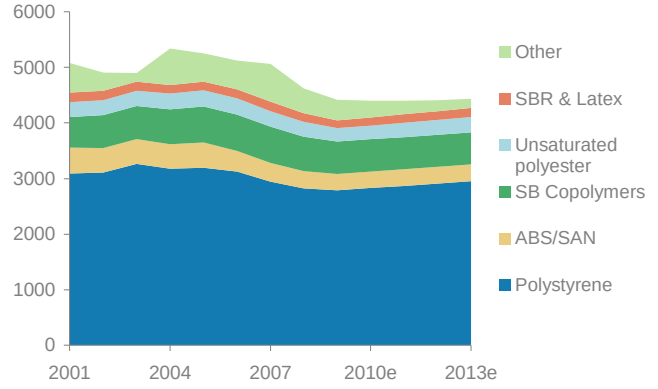
We estimate that Western Europe accounted for 20% of global styrene demand in 2009, making it the second-largest consumer. In Western Europe, ~61% of styrene is used to produce polystyrene; the second-largest derivative is S-B copolymer latexes, with 13%.

From 1998 to 2004, Western European styrene consumption grew steadily at 3–4% per year. Since 2004, consumption has fallen on average 3.7% per year due to the weak economy and substitution, much like in the US. Weak paper, electronic, and housing markets have hurt SB latex and ABS demand, while polystyrene has suffered from substitution by polyolefins and polyester.

We estimate that Western European consumption of styrene fell from 12.4kg/capita in 2001 to 8.2kg/capita in 2009.

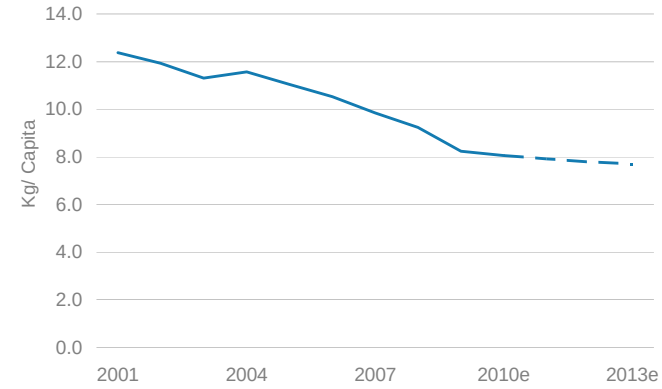
We forecast per capita consumption of styrene will continue to trend downward to 7.7kg in 2013 (a negative 1.7% CAGR). That per capita decline would imply broadly flat overall consumption in Western Europe.

Exhibit 63
Western Europe Styrene Consumption by Product



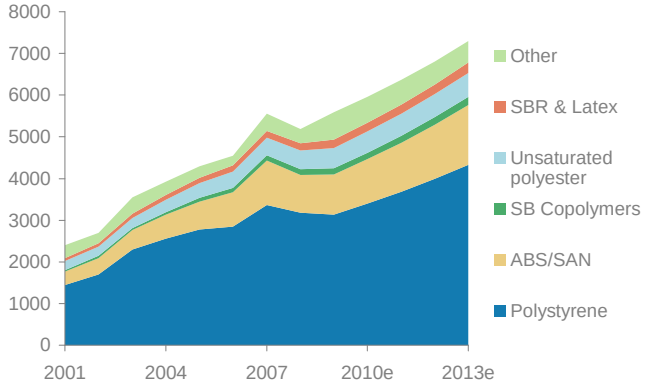
Source: SRI, Company data, Morgan Stanley Research

Exhibit 64
Western Europe Styrene Consumption per Capita



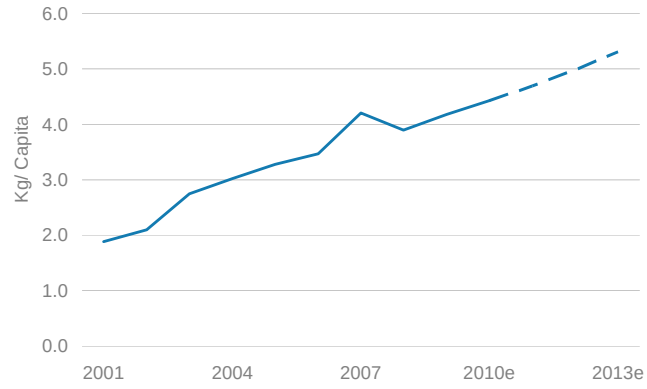
Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 65
China Styrene Consumption by Product



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 66
China Styrene Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

China

We estimate that Asia accounted for 53% of global styrene consumption in 2009, making it the world's largest consuming region. China itself accounted for 22% of global consumption, having grown by an average of 12% per year in 2000–09. In China, ~61% of styrene is used to produce polystyrene, with ABS/SAN resins the second-largest end product at 17%. China has been a significant net importer of styrene in recent years, with ~75% of its consumption imported in 2003–04. However, with 25% capacity growth per year in 2004–08 and more on the horizon, we estimate China will import <20% of its requirements by 2013.

We estimate that Chinese consumption of styrene rose rapidly from 1.6kg/capita in 2000 to 4.2kg/capita in 2009.

We forecast per capita styrene consumption will continue to rise, to 5.3kg in 2013 (a 6.2% CAGR). That growth would imply a 6.9% CAGR for overall consumption in China.

Ethylene Oxide and Ethylene Glycol

Ethylene oxide and ethylene glycol represent 14% of ethylene production. There are several uses for ethylene oxide (unlike ethylbenzene and ethylene dichloride, which are almost exclusively used to make styrene and vinyl chloride, respectively).

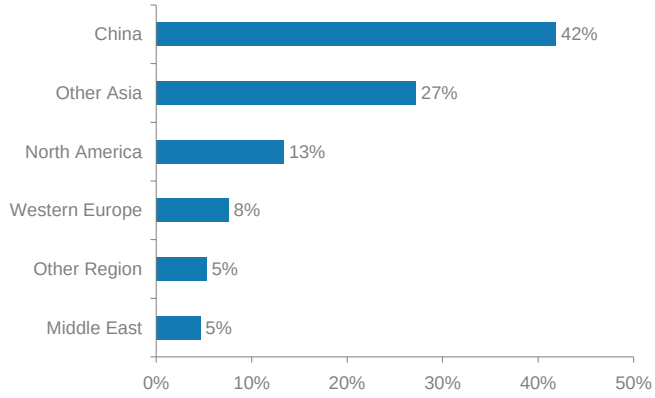
We estimate that ~70% of ethylene oxide is used to produce ethylene glycol, with the remainder being used to make other downstream derivatives such as ethoxylates, glycol ethers and ethanolamines.

Key uses

The key uses for ethoxylates include biodegradable detergents, and solvents for paints and lacquers, while ethanolamine is well known as a fumigant and sterilizing agent.

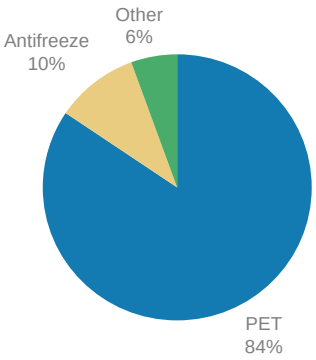
Ethylene glycol has two main uses. Ethylene glycol is highly reactive and it is used as a monomer in the production of polyester polymers and PET — the plastic used in water and beverage bottles. We estimate that the production of polyester polymers and PET accounts for 84% of ethylene glycol globally. Because it is soluble in water and has a low freezing point, it is also an ideal automotive antifreeze and is sometimes used as a deicer for aircraft surfaces. Globally this end use accounts for 10% of ethylene glycol use, although this varies by region.

Exhibit 67
Global Ethylene Glycol Consumption by Region



Source: SRI, Company data, Morgan Stanley Research

Exhibit 68
Global Ethylene Glycol Consumption by End Product



Source: Company data, Morgan Stanley Research

Exhibit 69
Global Ethylene Glycol Consumption ('000s of metric tons)

	PET	Antifreeze	Other
Consumption in m Tons			
North America	1,544	562	224
Western Europe	942	200	183
Middle East	665	65	79
China	6,610	581	109
Other Asia	4,297	156	291
Other Region	655	181	86
Total	14,713	1,745	972
North America	66.3%	24.1%	9.6%
Western Europe	71.1%	15.1%	13.8%
Middle East	82.2%	8.0%	9.8%
China	90.5%	8.0%	1.5%
Other Asia	90.6%	3.3%	6.1%
Other Region	71.0%	19.6%	9.3%
Total	84.4%	10.0%	5.6%

Source: Company data, Morgan Stanley Research

North America

We estimate that the US accounted for 13% of global ethylene glycol (EG) consumption in 2009, making it the world's second-largest consumer. In the US, ~65% of EG is used in the production of polyester polymers and PET, and 24% as an antifreeze. During the past 20 years, PET and polyester polymers have been the key driver of demand growth, showing a CAGR of 2.2%. In 1990, PET and polyester polymers accounted for 46% of EG use.

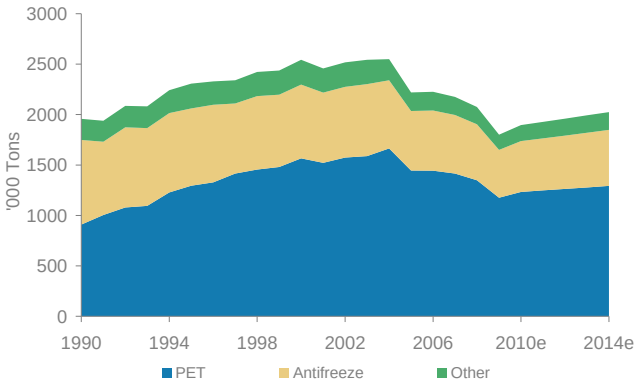
Consumption peaked in 2004… In the US, EG consumption grew steadily at 8.4% per year in 1997–2004. However, since the peak in 2004, EG consumption has declined at an average annual rate of 5.3%, primarily due to a poor economic conditions and an increased awareness of recycling.

…as PET use declined… PET solid-state resins have been the fastest-growing outlet for EG in the last decade. PET (the plastic used in beverage bottles) was introduced in 1976, and grew rapidly due to its widespread acceptance in blow-molded bottles for carbonated soft drinks. Regenerated PET received FDA approval for food contact in 1991, allowing postconsumer PET to be recycled to its original use (closed-loop recycling), and thereby further improving its image as an environmentally conscious package. Improved cleaning methods also have expanded the scope of recycled resins.

However, during the last several years, the momentum to mandate recycling has waned as these issues have lost their political prominence, especially in light of often unfavorable economics.

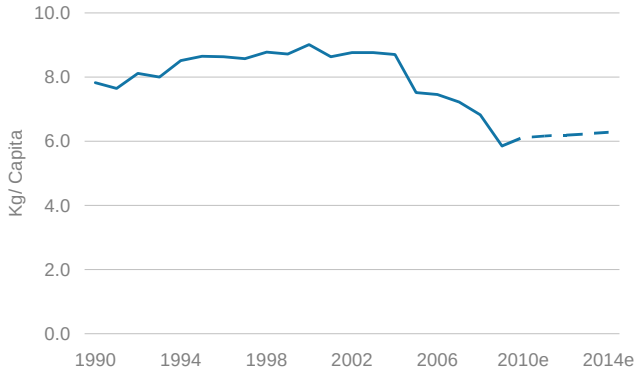
…and its use in antifreeze declined. In recent years there has been a gradual shift to use propylene glycol instead of EG in antifreezes. Propylene glycol–based antifreezes and coolants have been promoted as a safer alternative to EG-based antifreeze/coolant because of monopropylene glycol's lower toxicity; propylene glycol has a market share of about 10%. The majority of aircraft deicing fluids in the US are now monopropylene glycol based and have displaced EG; we believe this has displaced approximately 50 thousand metric tons of EG in the past several years.

Exhibit 70
US Ethylene Glycol Consumption



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 71
US Ethylene Glycol Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

From 1995 to 2004, we estimate per capita consumption of EG in the US remained broadly flat at 8.5–9.0kg, but has since declined to 5.9kg.

Our forecasts assume that US per capita consumption of EG rises by 7% in 2009–14 (a 1.4% CAGR), to 6.3kg. That per capita growth would imply a 2.4% CAGR for overall consumption. This growth is predominantly driven by a recovery from the recession and per capita consumption will still be well below prior levels.

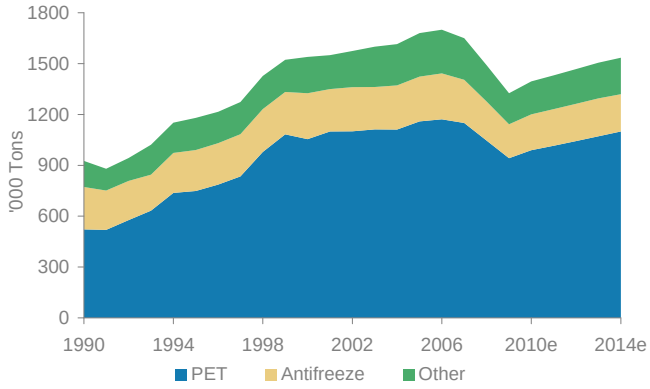
Western Europe

We estimate that Western Europe accounted for 8% of global EG consumption in 2009, making it the world's third-largest consumer. In Western Europe, ~70% of EG is used in the production of polyester polymers and PET, and 15% is used as an antifreeze. Like in the US, PET and polyester polymers have been the key driver of demand growth in the past 20 years. In 1990, PET and polyester polymers accounted for 56% of ethylene glycol use.

Western Europe has historically been a net importer of EG, and we expect this trend to continue. Local integrated producers focus on value-added derivatives such as ethoxylates, glycol ethers, and ethanolamines, while PET producers must import EG to meet their requirements. The Middle East is the supplier of EG to Western Europe, with 75% of total imports in 2009, up from 20–40% in the 1990s.

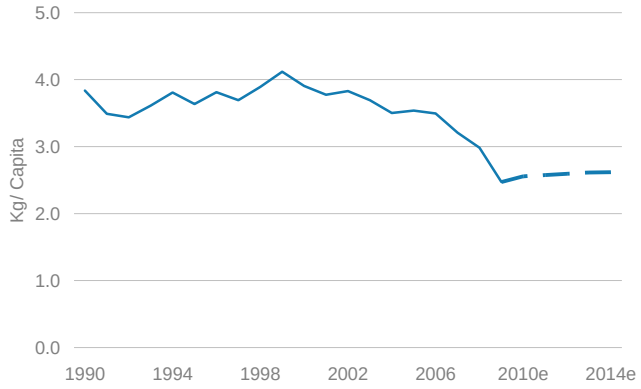
Consumption peaked in 2006. In Western Europe, EG consumption grew at 3.3% per year in 1997–2006, driven primarily by 4.2% annual growth in PET demand. However, since the peak in 2006, EG consumption has declined at an average annual rate of 7%, primarily due to poor economic conditions and an increased awareness regarding recycling. Demand for EG from the antifreeze market has been stagnant for several years, and we expect only modest growth over the next 5 years (a 1.9% CAGR in 2009–14).

Exhibit 72
Western Europe Ethylene Glycol Consumption



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 73
Western Europe Ethylene Glycol Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

We estimate per capita consumption of EG in Western Europe peaked at 4.1kg in 1999 and fell to just 2.5kg in 2009.

Our forecasts assume that Western European per capita consumption of EG will increase slightly, to 2.6kg by 2014 (a 1.1% CAGR). That per capita growth would imply a 3.0% CAGR for overall consumption.

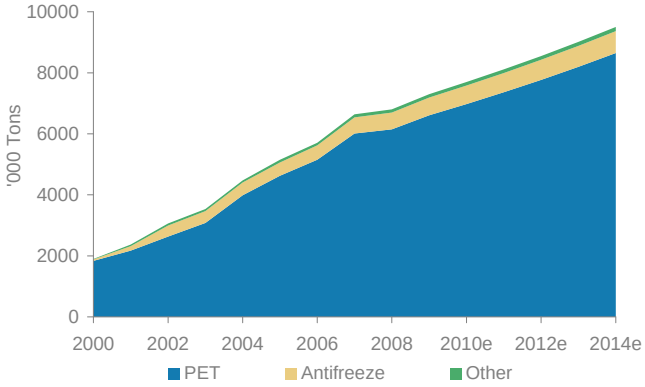
China

We estimate that Asia accounted for 69% of global EG consumption in 2009, making it world's largest consuming region. China itself accounted for 42% of global consumption, having grown by an average of 16% per year in 2000–09. In China, PET is the largest use of EG, accounting for >90% of total demand. Chinese EG demand has benefitted from a substantial shift in global PET capacities from developed regions like the US to China. There are now hundreds of companies producing PET in China. Around 8% of Chinese EG is consumed as an antifreeze.

We estimate that Chinese consumption of EG rose from a low base of 1.5kg/capita in 2000 to 5.5kg/capita in 2009.

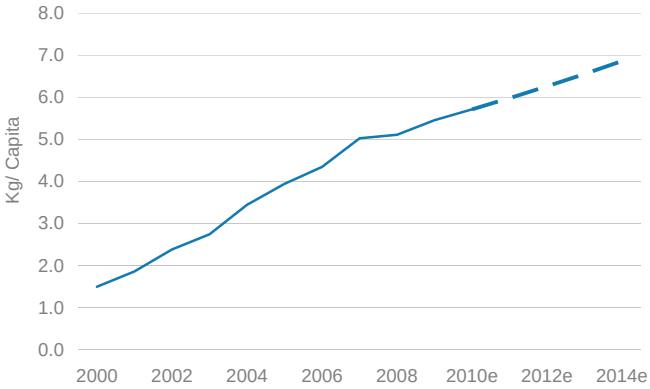
We forecast per capita EG consumption will continue to rise, to 6.9kg in 2014 (a 4.7% CAGR). That growth would imply a 5.4% CAGR in overall consumption in China.

Exhibit 74
China Ethylene Glycol Consumption



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 75
China Ethylene Glycol Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

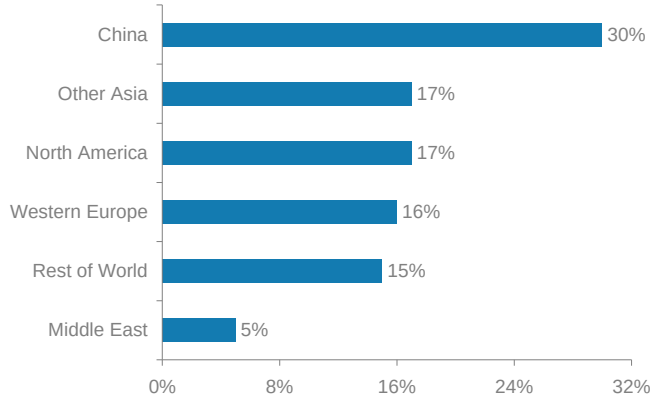
Ethylene Dichloride and PVC

Ethylene dichloride (EDC) represents 12% of global ethylene production.

EDC produces VCM, which produces PVC. EDC is produced by the chlorination or oxychlorination of ethylene and is almost entirely used to produce vinyl chloride monomer (VCM). VCM is then almost entirely used to produce polyvinyl chloride (PVC), which is therefore the key determinant of demand.

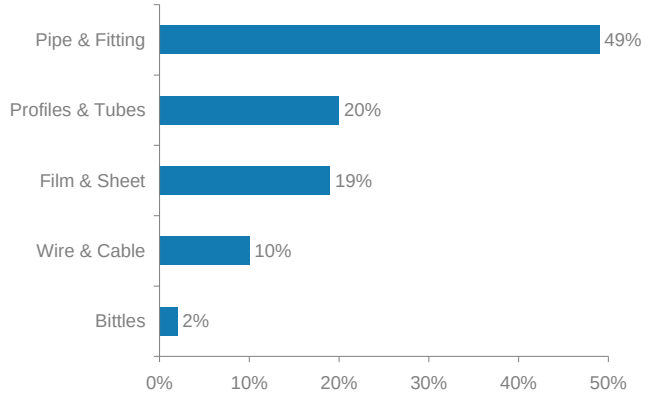
PVC is a highly versatile thermoplastic that can be used rigid (65% of consumption) or flexible (35% of consumption) by adding plasticizers. It has good strength, chemical and weather resistance, and electrical properties and is very easy to process. Roughly 70% of global PVC consumption is dependent on construction markets.

Exhibit 76
PVC Consumption by Region



Source: SRI, Company data, Morgan Stanley Research

Exhibit 77
PVC Consumption by End Product



Source: SRI, Company data, Morgan Stanley Research

North America

We estimate that North America accounted for 17% of global PVC consumption in 2009, making the region the world's second-largest consumer. In North America, ~75% of PVC is used in construction applications, with 3–7% in each of packaging, consumer, electronics, and transport applications.

After growth, PVC consumption has fallen in line with the housing market… From 1995 to 2004, North American PVC consumption grew at 3.6% CAGR, with the construction markets the key driver (4.5% CAGR). PVC demand fell with the downturn in the US housing markets, by an average of ~7% per year in 2004–09, we estimate.

…particularly existing home sales and remodeling. US PVC consumption generally correlates closely to existing home sales (rather than new build) because a large amount of the construction related consumption is used for remodeling existing homes. From 2003 to 2007, the US remodeling market grew by 9% per year due to a trend for remodeling kitchens and bathrooms, which require PVC.

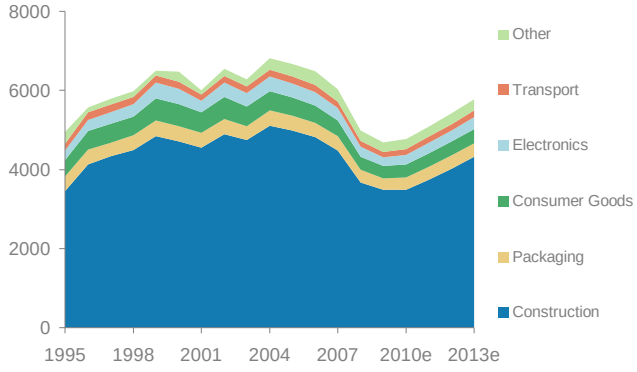
Existing home sales peaked in September 2005 at 6.3 million and appear to have bottomed in 1Q09 at 4.2 million, a 34% decline. Driven by the tax stimulus in 3Q-4Q09, existing home sales increased (year-on-year) 25% in 4Q09 and 9% in 1Q10, but they have since stagnated. While directionally, we believe they are correct, we suspect the actual growth will be somewhat less.

New housing starts have experienced an even greater decline, from 2.1 million (3Q05) to 530,000 (1Q09), an 75% decline from peak to trough. Longer term, our economists believe 1.3–1.5 million new homes per year are required to satisfy household formation trends; experts with whom we have consulted support this view. This would suggest that once we have passed through this period of massive oversupply (which may take several years), housing starts could more than double from their current level.

We estimate that North American consumption of PVC has fell from a peak of 23kg/capita in 2004 to ~15kg/capita in 2009.

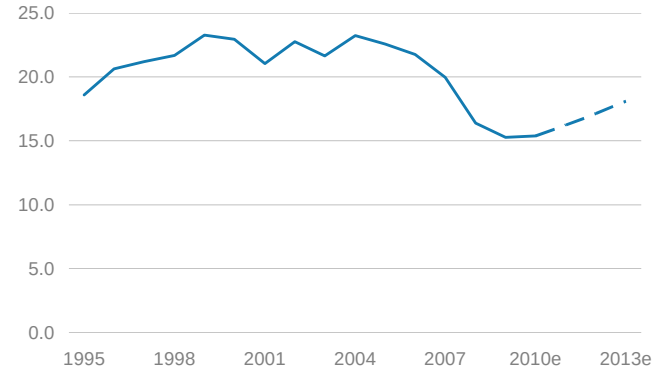
We forecast per capita consumption will rise to 18kg in 2013 (a 4.4% CAGR). That growth would imply a 5.4% CAGR in overall consumption.

Exhibit 78
North America PVC Consumption



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 79
North America PVC Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Western Europe

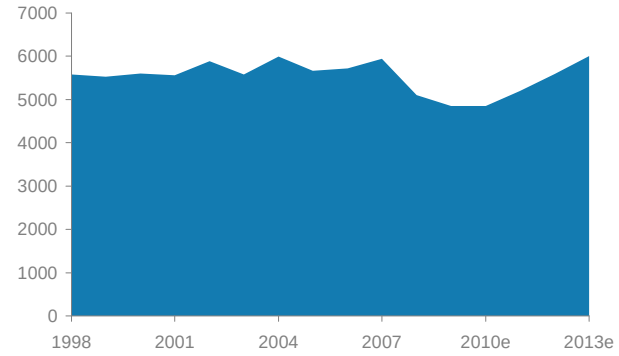
We estimate that Western Europe accounted for 16% of global PVC consumption in 2009, making the region the world's third-largest consumer. In Western Europe, ~67% of PVC is used in construction applications, 10% in packaging, and 8% in electrical applications. From 1997 to 2007, consumption of PVC in Western Europe was relatively steady at 5.5–6.0 million tons, hampered by environmental concerns (many over the toxicity of plasticizers used). In 2008, PVC consumption fell 14% due to the global economic crisis, tough credit conditions, and destocking in the distribution channel.

The PVC markets in Western Europe are largely mature. Germany and Italy are the largest consuming countries of PVC pipes in Europe, although Germany and the Nordic countries are seeing some shift toward polyethylene pipes due to concerns around recyclability and safety. With 55% of its window frames made from PVC, Germany is also by far the largest windows and profile market in Europe.

We estimates per capita consumption of PVC in Western Europe has fallen from a peak of 14.3kg in 2002 to ~9kg in 2009.

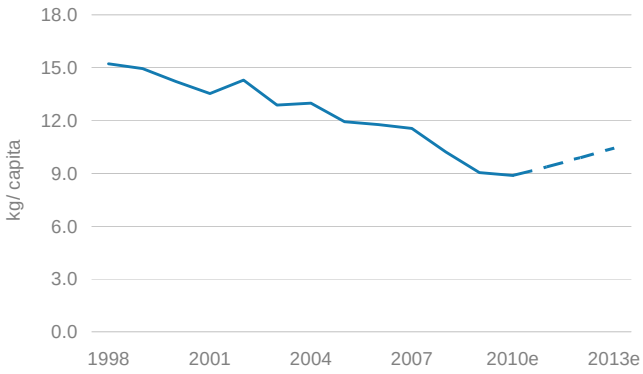
Our forecasts assume that Western European per capita consumption of PVC will increase by 15%, to 10.4kg by 2013 (a 3.6% CAGR). That per capita growth would imply a 7% CAGR for overall consumption.

Exhibit 80
Western Europe PVC Consumption



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 81
Western Europe PVC Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

China

We estimate that Asia accounted for 47% of global PVC consumption in 2009, making it world's largest consuming region. China itself accounted for 30% of global consumption, having grown by an average of 13% per year in 1995–2009. Consumption grew rapidly in the buildup to the 2008 Beijing Olympics, then fell by 5% when the global financial crisis hit. Future demand is unlikely to match this historical rate due to a diminishing cost advantage as coal and labor costs rise, and increased efforts from government to reduce pollution. We estimate 59% of Chinese PVC is consumed in construction applications.

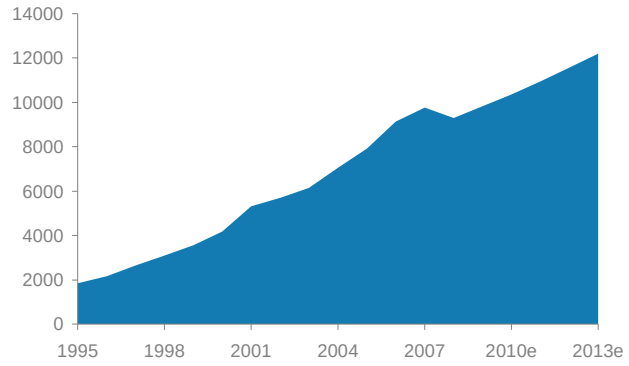
Coal-based Chinese PVC capacity is a substitute for ethylene. VCM (and therefore PVC) can also be produced by the hydrochlorination of acetylene, which is derived from coal. This technology is used only in China, where it accounts for ~70% of domestic PVC capacity. Most of the coal-based plants are in the west and northwest, where there is a good

supply of cheap coal; capacities on the eastern seaboard are based on ethylene as it is expensive to haul coal to them. In 2005–07 many coal-based plants expanded capacity to take advantage of cheap coal relative to rising ethylene prices. This large supply of coal-based PVC capacity means that any increase in Chinese demand for PVC may not translate directly into demand for ethylene. It also brings risk of fluctuating demand for ethylene in China depending on the relative economics of coal- versus ethylene-based plants.

We estimate that Chinese consumption of PVC rose from 3.3kg/capita in 2000 to 7.3kg/capita in 2009 in China.

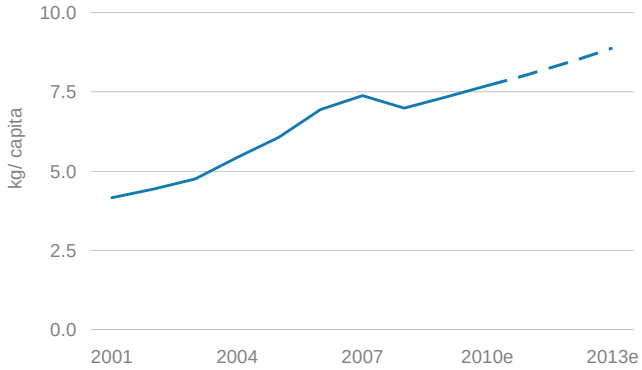
We forecast per capita PVC consumption will increase by 21%, to 8.9kg by 2013 (a 4.9% CAGR). That growth would imply a 5.6% CAGR in overall consumption.

Exhibit 82
China PVC Consumption



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Exhibit 83
China PVC Consumption per Capita



Source: SRI, Company data, Morgan Stanley Research
e = Morgan Stanley Research estimates

Supply

Limited New Petrochemical Supply Coming Online Beyond 2011

Supply additions are winding down: Capacity added after 2011 should be well below recent incremental demand growth. Following a capacity increase equivalent to 10% of total 2009 capacity, we expect a significant slowdown in the opening of new manufacturing facilities in 2011–14. New openings in 2011 should equal just 2.9% of 2010 capacity, and new openings between 2011 and 2014 should equate to just 2.3% of 2010 capacity, on average.

We see two structural problems limiting investment:

- The Middle East (excluding Qatar) is clearly limited in natural gas reserves. The reserves available to Saudi Arabia and other Middle Eastern countries have allowed them to develop 41% of the new capacity in 2009–11e. But there is a clear slowdown in new openings in the Middle East beyond 2011, suggesting that petrochemical companies have exhausted available quotas of cheap natural gas.
- The global credit crunch has squeezed finances at most petrochemical producers, limiting expansions.

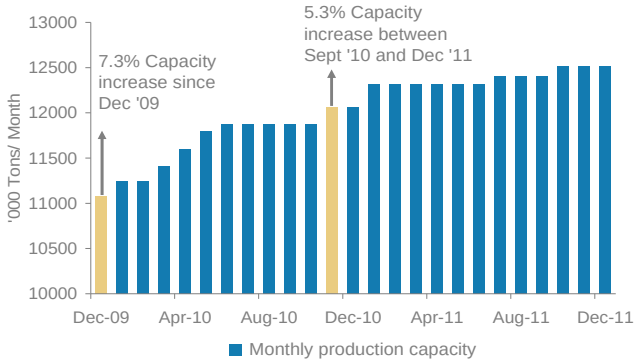
We would not rule out plant closings, but expect only 30% of what is in consensus. Environmental and power legislation in China may result in some of its oldest and least efficient plants closing. We have identified 16 plants, constructed during the 1980s or early 1990s, with annual capacity <350 thousand tons that may be at risk of closure.

Supply Outlook Set to Improve

Consensus is generally bearish on global supply, anticipating a 13% increase in 2010–11. Consensus widely anticipates a large increase in ethylene supply in 2010, with CMAI forecasts (upon which consensus estimates are based) anticipating an increase of 15 million tons, or an increase of 11.4%. Based on the timing of the new capacity, consensus (and CMAI) expect operational capacity to increase by 10.8 million tons, equivalent to an increase of 8.1%.

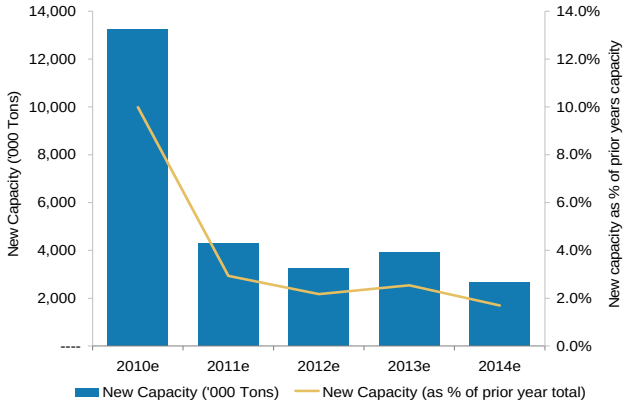
As more than half of anticipated capacity expansions are done, we expect supply to be up just 5% more by YE2011. Following our recent Middle East field trip, during which we visited companies responsible for 13% of global ethylene capacity and ~40% of near-term capacity additions), and our discussions with many of the Asian companies bringing new capacity to the market, we believe consensus forecasts likely assume too much additional capacity in 2010, with some plant startups delayed into 2011.

Exhibit 84
Global Capacity Expansions: Monthly Production Capacity Dec. 2009–Dec. 2011



Source: Company data, Morgan Stanley Research estimates

Exhibit 85
New Capacity Is Limited in 2011 and Beyond



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

On our estimates, 55% of the anticipated 2009–11 global capacity expansion took place through 3Q10, with just 7.9 million tons of capacity to enter production in the next 15 months, equal to an increase of 5.3% over current capacity, or 4.2% annualized.

We forecast global capacity increasing by 13.3 million tons in 2010, equivalent to 10% of global supply. Based on the timing of startups, we expect an operational capacity increase of 7.8 million tons, equivalent to 5.9% of current supply.

Exhibit 86

Status of Global Capacity Expansions Widely Anticipated in 2010

Company/ location	Capacity	Timing of start up	Likely production volume in 2010	CMAI assumption
Middle East				
Morivarid PC, Bandar, Iran	500	Not operation by June 2010	----	334
RLOC, Ras Laffan, Qatar	1,300	Operational in May 2010	867	975
SHARQ (SABIC), Al Jubail, Saudi Arabia	1,300	Operational on April 1, 2010	975	1,100
Yansab (SABIC), Yanbu, Saudi Arabia	1,300	Operational on Mar 1, 2010	1,083	433
Borouge II, Abu Dhabi	1,400	Operational in Nov, 2010	233	700
Middle East Total	**5,800**		**3,158**	**3,542**
China				
Dushanzi PC	1,000	Operational in Q4 '09	1,000	667
Fujian Ref and Chem/ Quanzhou	800	Operational in Q4 '09	800	533
Panjin	450	Unclear regarding timing	----	450
SINOPEC/ SABIC (Tianjin)	1,000	Operational on May 11, 2010	667	1,000
SINOPEC (Zhenhai)	1,000	Operational in May '10	583	750
Other	200	Unclear regarding timing	----	100
China Total	**4,450**		**3,050**	**3,500**
South East Asia				
Shell Chemical, Pulau Bukom, Singapore	800	Operational in Mar 2010	600	667
MOC, Map Ta Phut, Rayong, Thailand	900	Likely delayed until Q1 2011	----	675
PTT Polyethylene, Map Ta Phut, Thailand	1,000	Likely delayed until Q1 2011	----	917
South East Asia Total	**2,700**		**600**	**2,259**
India				
Indian Oil	857	Operational in April '10	571	643
India Total	**857**		**571**	**643**
Other				
Oltchim (Romania)	200	Acquisition, already operational	----	200
Braskem (Brazil)	200	Likely in Q4	50	50
Karpatneftekhim (Ukraine)	300	4Q '10	75	250
GAIL (India)	100	4Q '10	15	45
Haldia (India)	150	Operational in Jan	150	125
Shenhua Baotou (Mongolia)	300	Likely in Q4 '10	75	100
LG Chem (Yeosu, Korea)	100	Operational during Q2	75	75
Other Total	**1,350**		**440**	**845**
2010 Total	**15,157**		**7,820**	**10,789**
Total capacity increase expected in 2010 (%)			***5.9***	***8.1***

Source: Company data, Morgan Stanley Research estimates

Some 44% of the new 2010 capacity will be feedstock advantaged. On our estimates, 5.8 million tons (equivalent to 44% of incremental supply) will be based on cost advantaged light feedstock (such as ethane and propane) in regions such as the Middle East. We understand that most of this capacity has increased utilization rates at remarkably high rates (e.g., >95% utilization within 2–3 months of startup). On our estimates, 7.5 million tons (equivalent to 56% of incremental capacity) will be using heavy feedstocks, and is likely to sit fairly high on the cost curve.

The other source of concern is the scale of the capacity additions in China. However we estimate that ~75% of Chinese capacity additions expected in 2010 started production between December 2009 and March 2010. This increase in capacity represents a 30% increase in Chinese capacity and a 2.3% increase in global capacity and is ~30% of incremental global supply that we anticipate during 2010. Despite these significant increases in domestic capacity, China remains an importer of US ethylene derivatives. We believe that imports from the Middle East have temporarily replaced US imports.

Due to delays to 2010 startups, we see risk of capacity additions surpassing consensus expectations for 2011. Consensus anticipates new facilities totaling 2.4 million tons of capacity starting production in 2011. In our view, two facilities in Thailand totaling 1.9 million tons of capacity expected in 2010 will be delayed into 2011, following political issues involving the Map Ta Phut site. Our due diligence suggests that SABIC's Kayan is on track for a 3Q11 startup, with the ethylene plant on-spec by June 2010 and derivative units in the final stages of construction. We have little information on the ExxonMobil Singapore plant, with 1 million tons of capacity, so assume a midyear startup, in line with CMAI's forecasts. We therefore see an increase in capacity totaling 4.3 million tons in 2011, equivalent to 2.9% of global supply. Importantly, 1.9 million tons of this incremental capacity will commence operations during the first two months of 2011, suggesting that there is some risk of modest oversupply in 1Q11.

Beyond 2011, however, capacity increases appear to moderate. We see new capacity of 3.3 million tons entering the market in 2012, followed by 3.9 million tons in 2013, and 2.7 million tons in 2014. But these represent global capacity increases of just 2.2%, 2.5%, and 1.7%, respectively. Based on our expectation of robust demand growth, global utilization rates appear set to tighten significantly during this period.

There are rising barriers to the construction of new ethylene capacity globally:

- The credit crunch has resulted in lower capex plans at most petrochemical producers globally. Capex requirements for a new light feedstock ethylene plant, plus associated derivative units is likely to be $2–3 billion in the US and considerably more in emerging markets. We note that capex for SABIC's Kayan project exceeded $9 billion in summer 2010, nine months ahead of startup. Capex for a heavy feedstock plant and associated derivative units would likely exceed $3.5 billion in the US and, again, a considerably greater sum in emerging markets.

- A lack of additional natural gas supplies has also led to a curtailment of new "feedstock advantaged" petrochemical plants in many Middle East countries. SABIC believes that Kayan will use the final gas allocation in Saudi Arabia and will be the company's last light feedstock cracker. Note that the debt financing for Yansab, Sharq, and Kayan depended on fixed feedstock costs for set durations. Such financing is now more scarce as future Saudi feedstocks now more likely to be based on naphtha (and thus linked to the oil price and not offering significant discounts). We would therefore expect SABIC to focus its efforts more on downstream activities through acquisitions. We understand that there is plenty of natural gas available in Qatar and Abu Dhabi.

We would not rule out capacity rationalization, but we think consensus exaggerates its potential. In 2008 and 2009, with light natural gas–based feedstocks advantaged over heavy feedstocks and the start of the global economic recession, ~2.5 million tons of mainly heavy feedstock production capacity was shut down in the US.

CMAI and consensus forecasts assume a further 2.8 million tons of capacity is rationalized in 2011 and another 1.5 million tons in 2012. These assumptions appear possible but quite optimistic to us.

We assume one-third as many closures as consensus. Our base case is 1 million tons of capacity closures in 2011 and an additional 1 million tons of capacity closures in 2012, approximately 30% of that assumed by consensus.

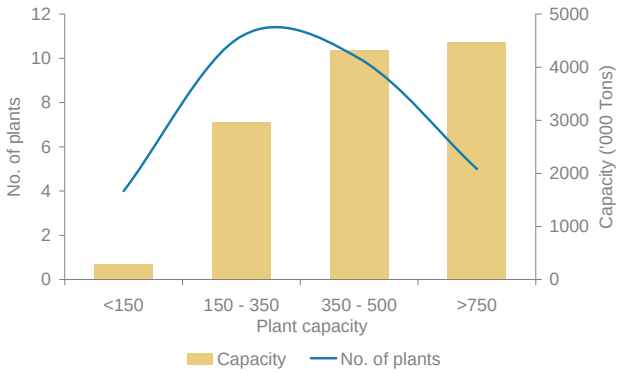
- Over the next two years, we think many US heavy feedstock crackers will convert to use a light feedstock. This would reduce effective capacity, and we believe the US might lose as much as 500 thousand tons of capacity from this mechanism alone.

- In addition, we have identified 15 European plants with annual capacity of less than 350 thousand tons per year that we believe will be challenged from an economics perspective. A low-capacity cracker, based in a high-cost, oversupplied region with no export opportunities will likely be challenged to deliver solid returns, in our view.

- We have also identified potential plant closures in China. We recently returned from China, where we met with many petrochemical companies, as well as the Chinese Petroleum and Chemicals Industry Federation. In recent years, China's substantial fixed asset investment in the chemicals sector has seen the construction of numerous "dirty" (high-emissions) plants, an issue the government intends to tackle. The CPCIF made it clear that an increasing number of chemical companies would come under pressure from China's environmental protection agency to reduce emissions or shut down. Our research points to 16 plants, constructed during the 1980s or early 1990s, with annual capacity of less than 350 thousand tons that fit the CPCIF's definition of low utility for a high level of emissions and power consumption.

Exhibit 87

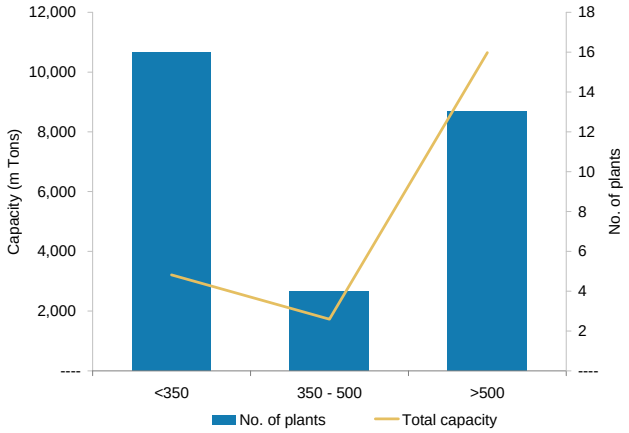
European Ethylene Capacity by Size of Plant



Source: Company data, Morgan Stanley Research estimates

Exhibit 88

Chinese Ethylene Capacity by Size of Plant



Source: Company data, Morgan Stanley Research estimates

Exhibit 89

Status of Global Capacity Expansion Plans in 2011–14

Company/ location	Capacity	Timing of start up	Likely production volume in 2010	CMAI assumption
2011				
Middle East				
Kayan (SABIC)	1,325	Q3 2011 (delayed from April '11)	331	1,025
China				
Zhongyuan PC, Puyang	60	2011e	15	15
South East Asia				
ExxonMobil, Pulau Ayer Chawan, Singapore	1,000	2011e	500	500
MOC, Map Ta Phut, Rayong, Thailand	900	Start up in Q1 '11. Delayed from 2010	900	675
PTT Polyethylene, Map Ta Phut, Thailand	1,000	Start up in Q1 '11. Delayed from 2010	1,000	917
2011 Total	**4,285**		**2,746**	**3,132**
2012				
Middle East				
Saudi Polymers, Al Jubail	1,200	2012e	600	
Ilam PC, Ilam, Iran	458	2012e	229	
China				
Fushun PC	800	2Q 2012e	400	
Sichuan PC	800	Likely delay until 2013	----	
2012 Total	**3,258**		**1,229**	
2013				
India				
OPAL	1,100	??	550	
China				
Daqing PC	600	??	300	
SINOPEC Wuhan	800	??	400	
Yulin Energy & Chemical Co.	600	??	300	
Asia (Other)				
CPC-Taiwan	800		400	
2013 Total	**3,900**		**1,950**	
2014				
Middle East				
Borouge (Abu Dhabi)	1,500		750	
Russia				
Novy Urengoy GCC	420		210	
China				
Shanghai PC	450		225	
Zhejiang Tiansheng	300		150	
2014 Total	**2,670**		**1,335**	

Source: Company data, Morgan Stanley Research

Feedstock Costs

Relative Profitability Will Be Driven by Feedstock

Feedstock costs will determine profitability: Cash costs associated with producing ethylene are driven predominantly by feedstock costs. We estimate that feedstock costs represent >80% of operating expenses in the production of ethylene.

The US is currently advantaged relative to Europe and Asia: Driven by a cheap natural gas/oil ratio, between 2006 and 2009, the US regained its position as a relatively low-cost producer of petrochemicals (compared to Europe and Asia). In 2009 and 2010, ethylene cash costs in the US were 30% lower than in Europe.

Consensus (CMAI forecasts) expects the US to lose some of its advantage based on higher natural gas and ethane prices: Driven by rising natural gas (and NGL) costs, CMAI (the basis for consensus forecasts) assumes US ethylene cash costs will rise by 31% from $609/ton in 2010 to $802/ton in 2014. Consensus forecasts assume that US integrated polyethylene margins will decline by 17% from $526/ton to $437/ton.

But we think that natural gas will remain cheap for some time: Morgan Stanley commodities strategist Hussein Allidina believes the US is fundamentally oversupplied in natural gas (much of which is "wet," with a high NGL content), much of which will come to the market in late 2011.

…and that US ethane will get cheaper, too: With significant new fractionation capacity anticipated in 2011–12, US ethane is set to trade closer to parity with natural gas (on a BTU basis) rather than oil. In 2014, a US ethane price of $0.40–0.50/gallon appears more likely than $0.79/gallon, the price upon which consensus petrochemical margins are based.

US petrochemical margins to remain strong: Based on our assessment of US feedstock costs, we expect US cash costs to decline, not rise. And global petrochemical selling prices should rise, driven by a rising oil price. We forecast that in 2014, cash costs will be 35% lower than consensus expects and polyethylene cash margins 60% better than consensus expects.

Margins in Europe and North East Asia more dependent on utilization rates as feedstock-advantaged imports force down local utilization rates and oil-based feedstock costs remain uncompetitive compared to the US and Middle East.

Ethylene Economics

Feedstock is the largest and most important cost in the production of ethylene and is the major determinant of competitiveness. Heavy feedstock such as naphtha is derived from oil and its price therefore correlates closely with oil (R2 = 0.98). Light feedstock such as ethane derived from natural gas can have very different dynamics to oil, with many countries (particularly in the Middle East) offering heavily subsidized prices.

US Ethane

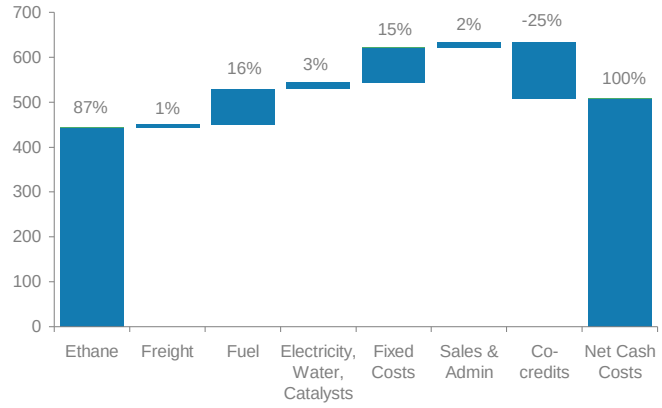
We estimate the net cash cost of producing one metric ton of ethylene in 2009 based on US ethane was ~$510.

Producing a ton of ethylene from ethane requires 1.302 tons of ethane, accounting for 87% of the net cash cost. The process yields ~78% ethylene, but produces significantly fewer co-products than naphtha-based production and no propylene. This means co-credits are an income of 25% against the net cost per ton of ethylene, with hydrogen and crude C3/C4s (propane and butane) the most valuable.

Fuel in the form of ~22mmbtu of natural gas is the second-largest cost, accounting for 16% of net cash cost. It is used to generate the high temperatures needed in the cracking process. The process also uses around 206 cubic meters of water per ton of ethylene to cool the output to stop (quench) the chemical reactions, and provide the steam needed. Chemicals and catalysts represent roughly $4 per ton.

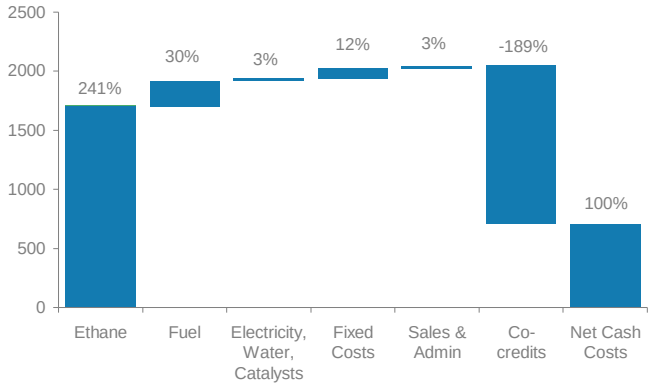
Fixed costs are relatively small; they account for 12% of the net cost, with maintenance the largest. We believe maintenance costs of an ethane-based cracker are about 3.5% of the capex cost, which equates to $45/ton. Insurance and overhead each account for a further 1% of capex cost, or $13–14 per ton. Ethylene plants are capital intensive rather than labor intensive, with labor costs of just $4 per ton (<1% of net cost).

Exhibit 90
US Ethane-Based Cost Breakdown



Source: Company data, Morgan Stanley Research

Exhibit 91
Western Europe Naphtha Based Cost Breakdown



Source: Company data, Morgan Stanley Research

Western Europe Naphtha

The majority of capacities in Western Europe are based on naphtha due to a lack of own natural gas (and therefore ethane) reserves.

We estimate the net cash cost of producing one metric ton of ethylene in 2009 based on Western European naphtha was ~$705.

Producing a ton of ethylene from naphtha requires on average ~3.3 tons of naphtha, although yields can vary due to the complexity of the process. This represents 241% of the net cash cost, while co-products represent an income of 189% against the costs (this shows just how important it is for naphtha-based producers to monetize co-products). The largest co-products are propylene (yields ~0.53 per ton of ethylene) and pygas (yields 0.75 per ton of ethylene), which each account for 30% of total co-credits. Other meaningful co-credits are fuel gas, crude C4s, and hydrogen.

Fuel in the form of ~24mmbtu of natural gas is the second-largest cost, accounting for 30% of net cash cost. As with ethane feed, it is used to generate the high temperatures needed in the cracking process. The process uses around 400 cubic meters of water per ton of ethylene (almost double that used for ethane feed) to cool the output to stop (quench) the chemical reactions, and provide the steam needed. Chemicals and catalysts represent roughly $7 per ton.

Fixed costs are relatively small; they account for 12% of the net cost, with maintenance the largest. We believe that maintenance, insurance, local taxes, and overhead costs of a naphtha-based cracker are 4.1% of the capex cost, which equates to $74 per ton. As in ethane-based plants, labor is a small cost at just $9 per ton (1.3% of net cost).

Exhibit 92
Comparison of Variable Input Cost Requirements by Region and Feedstock (per mt Ethylene)

	US Ethane		WE Naphtha		Asia Naphtha	
	Factor	per MT	Factor	per MT	Factor	per MT
Feestock	1.302	tons	3.3	tons	3.3	tons
Variable Costs						
Power	141.10	KWh	44	KWh	212.5	KWh
Fuel	22.05	mmbtu	24	mmbtu	25.5	mmbtu
Cooling Water	206	cm	400	cm	206	cm
Catalysts/chemicals	4	$	7	$	7	$
Co-credits						
Propylene	-	tons	0.53	tons	0.581	tons
Crude C3s	0.036	tons	-	tons	-	tons
Crude C4s	0.036	tons	0.34	tons	0.381	tons
Pygas	0.022	tons	0.75	tons	0.803	tons
Hydrogen	0.081	tons	0.05	tons	0.048	tons
Fuel	6.61	mmbtu	0.63	tons	25.54	mmbtu
Pyrolysis Fuel Oil	-	tons	-	tons	0.168	tons

Source: Company data, Morgan Stanley Research

Exhibit 93
Comparison of Fixed Cost Requirements by Region and Feedstock ($/mt Ethylene)

($/mt ethylene)	US Ethane	WE Naphtha	Asia Naphtha
Labor	4	9	6
Maintenance	45	45	38
Indusrance/Taxes	13	15	17
Plant Overhead	14	14	14
Fixed Costs	**76**	**83**	**75**
SG&A	**12**	**22**	**14**

Source: Company data, Morgan Stanley Research

Polyethylene Economics

Ethylene feedstock is the key input cost for producing polyethylene, with all grades requiring close to 1 ton of ethylene per ton of polyethylene.

It represents 66–71% of net cash costs, depending on the grade. LDPE uses 1.008 tons of ethylene per ton of PE and no co-monomer, leading to ethylene at 71% of net cost. HDPE uses 1.0 tons of ethylene (69% of net cost) and 0.017 tons of co-monomer (2% of net cost), leading to a total raw material bill of 71% of net cost. LLDPE uses only 0.93 tons of ethylene (66% of net cost), and as high as 0.08 tons of co-monomer (9% of net cost), for a total raw material bill of 75% of net cost.

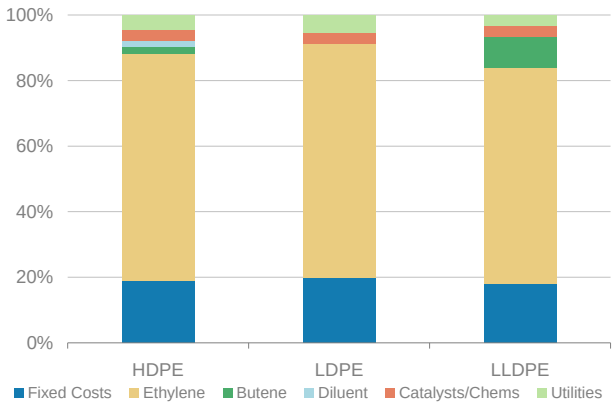
Utility cost differs by grade. The newest technology, LLDPE, is the most energy efficient, with a 3% of net cost, followed by HDPE at 4%, and the oldest technology, LDPE, at 5% due in part to the higher pressures the process uses. Catalysts and chemicals typically account for $31 per ton, or 3% of net cost, and HDPE requires additional diluents of $20 per ton.

Fixed costs excluding distribution costs are ~10% of net costs, with maintenance, insurance and overhead being the largest components at a combined 5.0–5.5% of the capex cost of a plant; this equates to $34 per ton for LLDPE, $44 for HDPE, and $49 for LLDPE. Labor accounts for ~0.5% of net costs; royalties due on the technology license, ~1.5%.

Distribution costs are the second-largest input cost at $94 per ton of polyethylene, or 10% of total costs, for all grades.

Exhibit 94

Polyethylene Cost Breakdown by Grade



Source: Company data, Morgan Stanley Research

Exhibit 95

Comparison of Polyethylene Input Cost Requirements by Grade

(per ton polyethylene)	Unit	HDPE	LDPE	LLDPE
Feedstock				
Ethylene	tons	1.000	1.008	0.930
Other (butene/octene/decene)	tons	0.017	-	0.080
Diluent	$	20	-	-
Catalysts & Chemicals	$	31	32	31
Utilities				
Power	$	28	43	22
Steam	$	6	0	1
Cooling Water	$	6	2	3
Nitrogen	$	3	6	5
Fixed Costs	$			
Maintenance, Insurance, O/H	$	44	49	34
Labor	$	5	5	3
Interest	$	7	7	7
Process royalties	$	14	14	14
SG&A	$	17	17	17
Distribution costs	$	94	94	94
Net Cash Cost		**958**	**938**	**937**

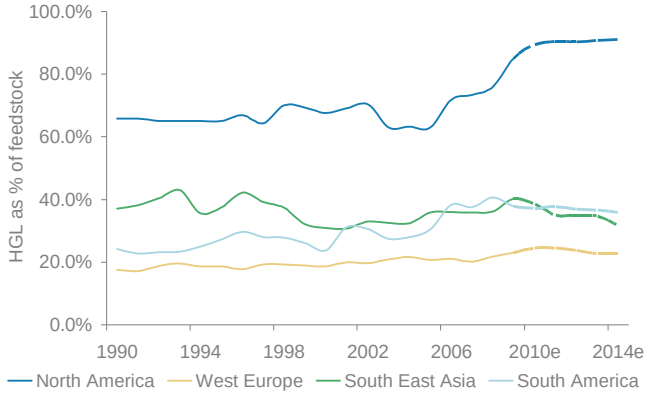
Source: Company data, Morgan Stanley Research

Profitability Depends on Location and Feedstock

North America has used a significantly greater proportion of natural gas liquids in its steam crackers than other regions (with the exception of the Middle East). In 1990–2002, NGL feedstock into steam crackers averaged 67% in North America versus 27% elsewhere in the world (Western Europe, Southeast Asia, and South America). NGL feedstocks in Northeast Asia are minimal (<1%) as a proportion of feedstock used.

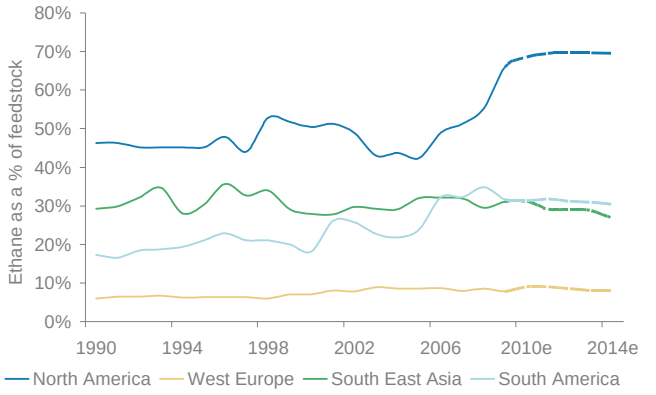
Exhibit 96

NGLs as a % of Steam Cracker Feedstock



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

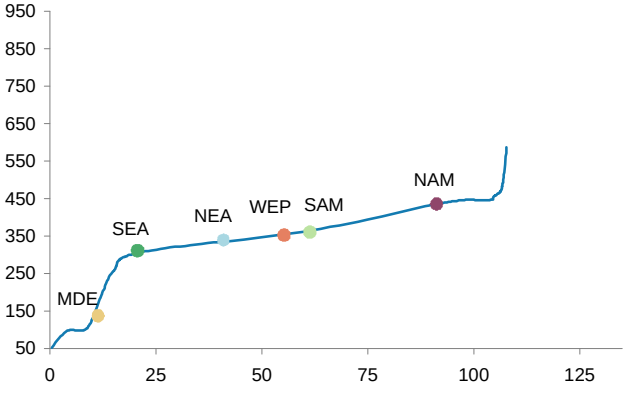
Exhibit 97
Ethane as a % of Steam Cracker Feedstock



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

When NGLs became relatively more expensive, the US was disadvantaged… Between 2002 and 2005, the dynamics of the ethylene industry changed as natural gas prices rose relative to crude oil, approaching parity on a BTU basis. This resulted in significant price increases for NGLs, making them the highest-cost feedstock for steam crackers. In response, the US industry shifted its feedstock slate to use more crude oil–based feedstock such as naphtha; NGLs as a proportion of feedstock declined from 70% in 2002 to 63% in 2005. Nonetheless, the US became the most expensive region globally to produce ethylene (see Exhibit 98).

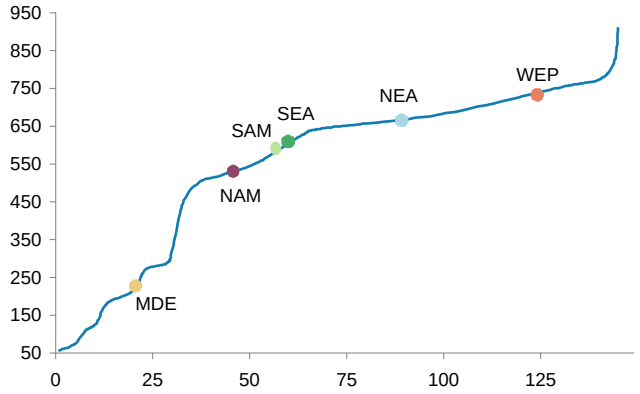
Exhibit 98
Ethylene Cost Curve (2003)
US was a feedstock disadvantaged producer; Europe and Asia advantaged



Source: CMAI.

…but now the feedstock environment has shifted back again. Starting in 2006, crude oil demand surged and crude oil prices rose to record levels. While US natural gas also increased, inflation was considerably lower, and on a BTU basis natural gas became the preferred feedstock in the US. By 2009, the US had become the third-cheapest place globally to produce petrochemicals (after the Middle East and Alberta). In addition, in 2008 and 2009, with light feedstock now advantaged over heavy feedstock and the commencement of the global economic recession, approximately 2.5 million tons of mainly heavy feedstock production capacity was shut down. By 2010, NGLs as a represented ~90% of US feedstock used and ethane represented >70% of US feedstock.

Exhibit 99
Ethylene Cost Curve (2009)
US now a structurally advantaged producer relative to Asia and Europe



Source: CMAI

Consensus forecasts assume that the US will lose much of its advantage during the next 3–5 years. As shown in Exhibit 100, CMAI (and Purvin and Gertz), upon which consensus forecasts are based assume that WTI increases from an average price of $78/bbl in 2010 to $90/bbl in 2014, broadly in line with the forward curve. CMAI assumes that US natural gas increases from a 2010 average of $4.50/mmbtu to $7.49/mmbtu and that US ethane (Mont Belvieu) increases from $0.59/gallon in 2010 to $0.79/gallon in 2014.

We think CMAI likely underestimates the advantage the US will have between 2012 and 2014. The CMAI forecasts are contrary to the current natural gas forward curve, which suggests that natural gas will remain cheap for a considerable period of time. Morgan Stanley commodities strategist Hussein Allidina forecasts natural gas prices at or below the forward curve certainly until 2012.

Exhibit 100

Consensus Is Based on Natural Gas Assumptions at a 30% Premium to the Current Forward Curve

	Natural gas $/mbtu			Crude Oil (WTI)/ $/bbl		
	CMAI	FWD Curve	Diff (%)	CMAI	FWD Curve	Diff (%)
2010e	4.50	4.40	2.2%	78	78	0.5%
2011e	4.74	4.47	6.0%	80	86	-7.2%
2012e	6.31	5.21	21.1%	83	88	-6.2%
2013e	7.07	5.50	28.5%	87	89	-2.5%
2014e	7.49	5.69	31.6%	90	90	0.2%

Source: Company data, Morgan Stanley Research

Ethane Pricing Scenarios

Ethane prices are determined by the relative balance of ethane supplied by natural gas processing plants and ethane demanded by petrochemical plants as a feedstock in the production of ethylene. Approximately 98% of ethane supply is derived from the extraction of ethane from natural gas by processing facilities, while a roughly equivalent percentage of demand is determined by ethylene steam cracker selection of ethane as a feedstock.

As a result, rich natural gas production, ethylene steam cracker utilization rates, and ethane feedstock selection levels by ethylene steam crackers are the key factors determining ethane prices. Both domestic and global ethylene and ethylene derivative markets influence these decisions.

There are broad conceptual parameters that help define ethane pricing within a supply-demand construct:

- *Natural gas serves as an effective floor for ethane prices,* as ethane needs to be priced at a positive spread to methane (referred to as a processing spread, fractionation spread, or keep-whole margin) to make it economic to strip ethane from natural gas beyond contractual requirements to meet pipeline specifications (BTU content, hydrocarbon dew points, contaminant levels, etc.).

In periods of negative ethane spreads, it becomes uneconomic under certain contracts to strip ethane from the natural gas; processors elect instead to sell the resulting higher BTU commingled product as natural gas.

In periods of positive spreads, the ethane is extracted to realize its higher relative pricing as a purity product, reducing the residue gas that remains.

Although negative ethane spreads occur at certain times and in certain geographies, these occurrences generally do not sustain themselves as supply rebalances itself through processing decisions.

- *Crude oil, in theory, serves as a ceiling for ethane* given that naptha, a crude oil derivative, is a competing feedstock for ethylene production, along with propane, which can be sourced from both natural gas and crude oil (ethane comprises roughly 55% of ethylene feedstock, propane 25% and naptha 15%).

Ethylene steam crackers will select feedstock based upon cash costs, in effect requiring ethane to sell at a cost advantage relative to naptha to maintain its attractiveness.

Feedstock selection will also be derived by co-product values (each feedstock yields different products, with ethane producing a significantly higher ethylene yield than other feedstocks — north of 80%).

In practice, ethane will generally trade at a significant discount to crude oil given crude's much wider range of end markets (ethane is essentially a one-market product) and relative scarcity to its respective demand. The 20-year average ethane/crude oil ratio is 47% on an energy equivalent basis, falling closer to 40% in recent years but varying widely at any given time.

- *While natural gas supply is a key determinant of ethane pricing, we think the key bottleneck is the fractionators,* who earn a spread on removing ethane and other NGLs from the natural gas. The US currently has 33 fractionators with an estimated total capacity of 2,429 MBPD, and estimated throughput of ~1,985 MBPD with ethane comprising 838 of those barrels (~42%).

As a whole, US fractionation plants run about 82% utilized. Although there appears to be excess fractionation capacity, there are areas where fractionation capacity is tight (e.g., Gulf Coast regions near petrochemical demand areas), and we continue to see infrastructure expansions and build-out. For instance, in Mont Belvieu (the major market hub for NGLs in the US) fractionation capacity totals 823 MBPD, with estimated throughput of 773 MBPD (a relatively high utilization rate of~94%), but numerous expansions and projects have been announced to increase capacity there.

According to company announcements, US fractionation capacity will increase by >16% during the next 18 months, from 2,430 MBPD to 2,835 MBPD. In our view, it is very unlikely that the US petrochemical industry can absorb such an increase in NGL production, suggesting that fractionation margins will come under some pressure.

While long-term forecasting of ethane prices is 'tricky,' we highlight three scenarios, along with the likely impact on US petrochemical margins.

Scenario 1: CMAI's estimates
CMAI's near-term scenario seems reasonable to us. CMAI's 2011 margin assumptions are based on an average price of natural gas of $4.74/mmbtu and crude oil of $80/bbl and an ethane price of $0.56/gallon.

Under these assumptions, the implied ethane floor (where ethane equals natural gas on a BTU basis) is $0.31/gallon and processors will earn $0.25/gallon stripping ethane from natural gas. Such assumptions appear reasonable, suggesting that CMAI forecasts are based upon a slight excess of ethane relative to 2010, potentially driven by increased "wet shale gas" coming to the market, increasing the quantity of NGLs relative to demand.

…but its long-term forecast appears less likely. CMAI forecasts then assume that natural gas gradually inflates to $7.49/mmbtu by 2014 and ethane inflates to $0.79/gallon in 2014. These assumptions must assume that ethane processors earn a better margin on each gallon processed, suggesting that supply/demand tightens marginally from 2011 levels.

While we would not rule out a $7.49/mmbtu natural gas price in 2014, it would require exceptional demand, which in turn would likely lead to increased infrastructure and increased supply of natural gas from the drilling companies. Under such a scenario, ethane is likely to be significantly oversupplied. There are plenty of potential uses for natural gas (methane) and other NGLs (propane and butane); however, ~98% of US ethane is used by the petrochemical industry, and there simply is not the spare capacity to deal with a significant increase in ethane supply. We estimate that the US petrochemical industry can handle an incremental 9% ethane supply without significant capital expenditure to convert heavy feedstock plants to light feedstock. Therefore, under CMAI's natural gas assumptions, we would expect the margin earned by processors to be lower in 2014, rather than higher, as ethane oversupply leads to reduced ethane pricing.

In this scenario, US cash costs bottom out at $587/ton in 2011 before inflating to $802/ton in 2014, with the US advantage over ROW (naphtha-based costs) increasing from 23% in 2010 to 28.5% in 2011 before declining steadily to 17.5% in 2014. We think this outlook for US margins is too bearish.

Scenario 2: CMAI's ethane margin assumptions with the forward curve for WTI and natural gas
As we have highlighted, CMAI's forecasts for natural gas take a very different view to the current forward curve.

Scenario 2 takes an identical view to Scenario 1 on the ethane margin that a processor would earn on fractionating ethane from natural gas ($0.25/gallon rising to $0.30/gallon in 2014) but uses the forward curve for natural gas. Under these assumptions, the ethane market would remain largely balanced and supply/demand would remain at its current ratio.

In this scenario, US ethane rises from $0.54/gallon to $0.68/gallon by 2014, and US cash costs decline to $570/ton in 2011 and then rise to $693/ton in 2014. The US cost advantage increases to 38% in 2011 and then declines to 29% in 2014, but always remains above the advantage witnessed in 2010.

Scenario 3: Morgan Stanley estimates
In this scenario, we assume natural gas and WTI follow the current forward curve; however, in our view, NGLs are unlikely to be fairly balanced until 2012. Therefore, in 2011, we assume that the ethane margin returns to a more normal level of $0.38/gallon. Then, toward the end of 2011, significant new fractionation capacity, combined with natural gas from liquids-rich plays coming to the market in 2012, results in a significant oversupply of ethane and a collapse of the ethane margin.

In this scenario, the ethane margin for processors declines from $0.29/gallon in 2010 to $0.12–0.13 in 2011–14. The US loses some of its cost advantage in 2011, but by 2012, US cash costs are 48% lower than European and Asian peers. We believe this cost advantage is sustainable under this scenario, our base case.

Exhibit 101

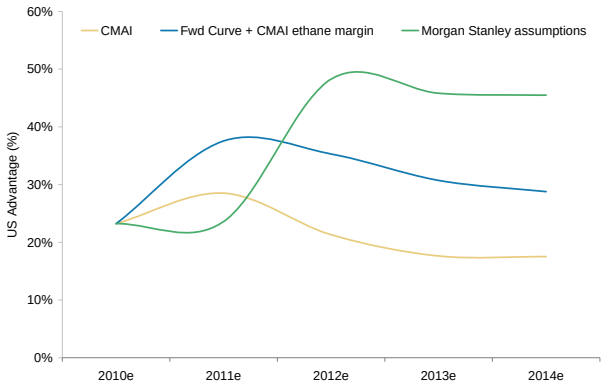
Ethylene Cash Costs Under Various NGL Scenarios

	2010e	2011e	2012e	2013e	2014e
Scenario 1: CMAI assumptions					
Natural Gas Outlook ($/mcf)*	$4.50	$4.74	$6.31	$7.07	$7.49
Crude Oil Outlook ($/bbl)	$78	$80	$83	$87	$90
Crude to Gas Ratio	17.3x	16.9x	13.2x	12.3x	12.0x
Ethane Price ($/gal)	**$0.59**	**$0.56**	**$0.69**	**$0.75**	**$0.79**
Assumed Ethane to Crude Oil Ratio	31.5%	29.5%	35.0%	36.0%	37.0%
Gas-Implied Floor	$0.30	$0.31	$0.42	$0.47	$0.50
Implied Ethane Margin ($/gal)	$0.29	$0.25	$0.27	$0.28	$0.30
US Cash costs	$609.1	$587.6	$708.2	$758.4	$802.2
ROW Cash costs	$793.4	$822.0	$899.9	$920.7	$972.4
US advantage	23.2%	28.5%	21.3%	17.6%	17.5%
Scenario 2: CMAI ethane margin assumptions but forward curve WTI and Natural Gas prices					
Natural Gas Outlook ($/mcf)*	$4.40	$4.47	$5.21	$5.50	$5.69
Crude Oil Outlook ($/bbl)	$78	$86	$88	$89	$90
Crude to Gas Ratio	17.7x	19.2x	16.9x	16.2x	15.8x
Ethane Price ($/gal)	**$0.59**	**$0.54**	**$0.62**	**$0.65**	**$0.68**
Assumed Ethane to Crude Oil Ratio	31.5%	26.5%	29.5%	30.5%	31.5%
Gas-Implied Floor	$0.29	$0.30	$0.35	$0.37	$0.38
Implied Ethane Margin ($/gal)	$0.29	$0.25	$0.27	$0.28	$0.30
US Cash costs	$609.1	$569.7	$639.8	$666.0	$692.7
ROW Cash costs	$793.4	$912.5	$989.0	$961.5	$972.4
US advantage	23.2%	37.6%	35.3%	30.7%	28.8%
Scenario 3: Morgan Stanley Assumptions (Fwd Curve for Nat gas + WTI with ethane in oversupply)					
Natural Gas Outlook ($/mcf)*	$4.40	$4.47	$5.21	$5.50	$5.69
Crude Oil Outlook ($/bbl)	$78	$86	$88	$89	$90
Crude to Gas Ratio	17.7x	19.2x	16.9x	16.2x	15.8x
Ethane Price ($/gal)	**$0.59**	**$0.68**	**$0.48**	**$0.49**	**$0.50**
Assumed Ethane to Crude Oil Ratio	31.5%	33.2%	22.9%	23.1%	23.3%
Gas-Implied Floor	$0.29	$0.30	$0.35	$0.37	$0.38
Implied Ethane Margin ($/gal)	$0.29	$0.38	$0.13	$0.12	$0.12
US Cash costs	$609.1	$697.3	$511.5	$520.8	$530.1
ROW Cash costs	$793.4	$912.5	$989.0	$961.5	$972.4
US advantage	23.2%	23.6%	48.3%	45.8%	45.5%

Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 102

US Cash Cost Advantage Under Our 3 Scenarios



Source: Company data, Morgan Stanley Research

Exhibit 103

Polyethylene Margins Under Each Scenario: US to Remain an Advantaged Producer

	2010e	2011e	2012e	2013e	2014e
Scenario 1					
Polyethylene price (US)	$1,459	$1,352	$1,378	$1,486	$1,566
Polyethylene price (ROW)	$1,477	$1,372	$1,336	$1,467	$1,581
US Integrated Margins	$526.2	$436.6	$338.5	$400.0	$439.2
ROW Integrated Margins	$521.6	$378.8	$260.6	$371.6	$438.3
US Profit advantage (%)	1%	15%	30%	8%	0%
Scenario 2					
Polyethylene price (US)	$1,459	$1,443	$1,467	$1,527	$1,566
Polyethylene price (ROW)	$1,477	$1,463	$1,425	$1,508	$1,581
US	$526.2	$545.0	$496.0	$533.2	$548.7
ROW	$521.6	$378.8	$260.6	$371.6	$438.3
US Profit advantage (%)	1%	44%	90%	43%	25%
Scenario 3					
Polyethylene price (US)	$1,459	$1,443	$1,467	$1,527	$1,566
Polyethylene price (ROW)	$1,477	$1,463	$1,425	$1,508	$1,581
US Integrated Margins	$526.2	$417.4	$624.3	$678.4	$711.3
ROW Integrated Margins	$521.6	$378.8	$260.6	$371.6	$438.3
US Profit advantage (%)	1%	10%	140%	83%	62%

Source: Company data, Morgan Stanley Research

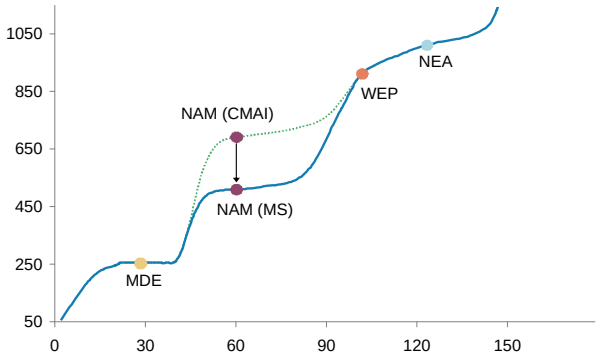
Implications for Profitability

Exhibit 103 shows how we expect global profitability to look for integrated polyethylene producers in the US and ex-US regions. The assumptions are based on CMAI's polyethylene pricing forecasts for Scenario 1, with the polyethylene price linked to the oil price in other scenarios (this relationship has had a correlation coefficient of 0.9 over the past 10 years).

Under our assumptions for natural gas and ethane margins, US cash margins will likely be ~80% higher than those forecast by CMAI. Even using CMAI's assumptions for the state of the US ethane market but the forward curve for natural gas (Scenario 2), US cash margins are likely to be 20% higher than those forecast by CMAI.

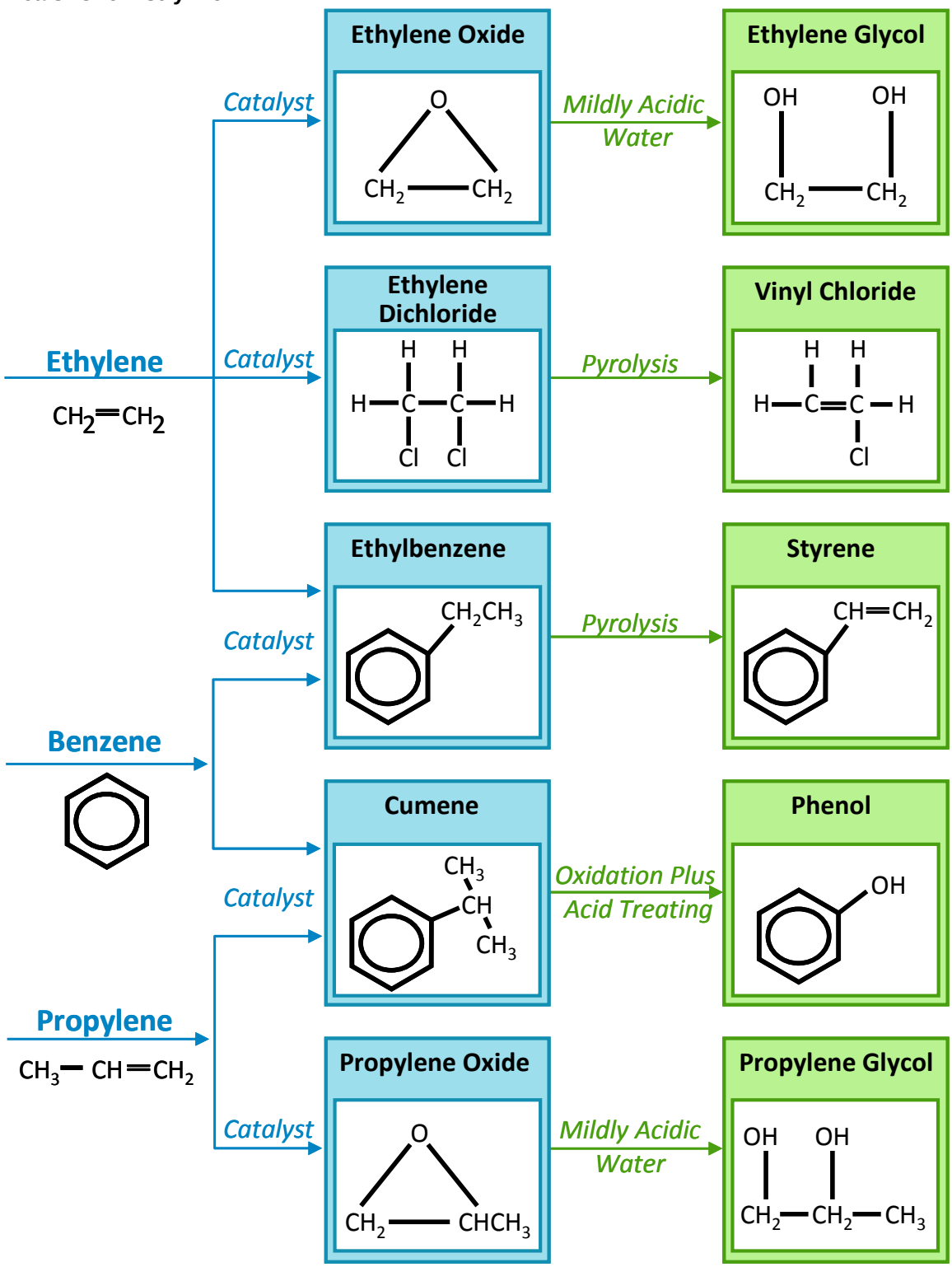
Exhibit 104

US Ethane Advantage Likely to Be Greater Than Assumed by Consensus in 2012+



Source: Company data, Morgan Stanley Research

Exhibit 105
Petrochemicals: Chemistry Flow

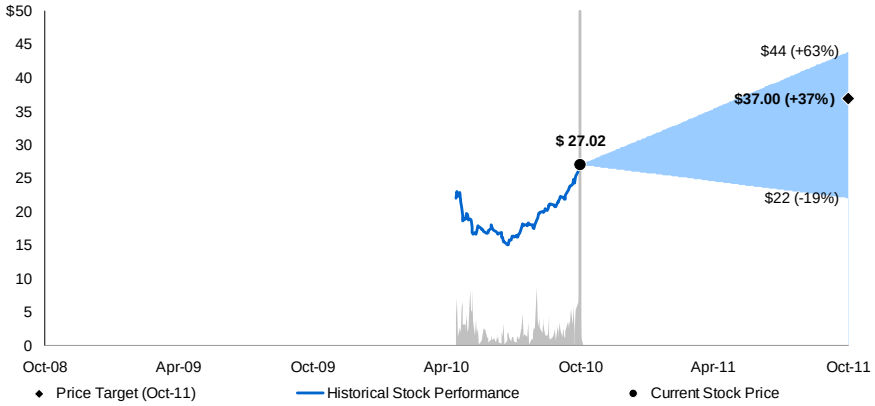


Source: Morgan Stanley Research

Focus Stocks

LyondellBasell Industries N.V. (LYB.N, $27, Overweight, Price Target $37)

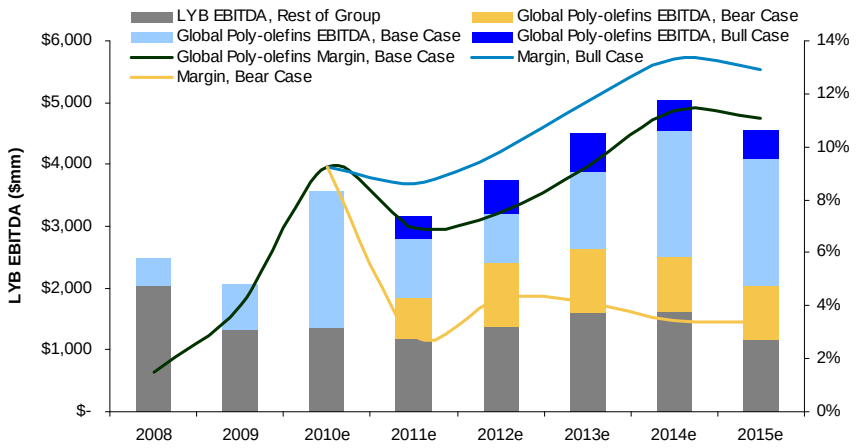
Risk-Reward View: 'Pure Play' on Advantaged US Petrochemicals



Source: FactSet, Morgan Stanley Research

Price Target $37		Blended average of DCF ($37), mid-cycle PE ($35), mid-cycle EV/EBITDA ($38). Assumes 10.2% WACC, 12.5% cost of equity, 13x mid-cycle P/E, and 6.2x mid-cycle EV/EBITDA (in line with the historical multiples of commodity chemicals companies).
Bull Case $44	11.7x Bull Case 2013 EPS of $3.76	**Ethane oversupply in US, strong global plastics demand:** 6% global growth supports higher polyethylene prices and margins (even for disadvantaged European assets), while LyondellBasell's US assets benefit from $0.33/gallon ethane.
Base Case $37	12.2x Base Case 2013 EPS of $3.03	**Sustainably cheap ethane, Europe still profitable:** China and India support strong demand growth for plastic and ethylene derivatives, allowing Europe to retain some margin. US producers' trough margins in 2011 are significantly higher than previous cycles, driven by sustainably cheap (~$0.50/gal) ethane.
Bear Case $22	14.1x Bear Case 2013 EPS of $1.56	**Weaker global demand, and US loses some advantage:** Weak recovery (2% global GDP growth) limits pricing for ethylene and derivatives, causing European margins to remain depressed. The US loses some of its advantage as ethane rises to $0.75/gal.

Key Driver: Global Olefins/Poly-olefins Margins Rising 2012–14e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Investment Thesis

- LyondellBasell, one of the world's largest producers of petrochemicals, is particularly leveraged to the US feedstock advantage that we expect will drive higher returns than in prior business cycles.
- Global supply / demand — we expect higher demand for plastics and other petrochemicals in China, India, and other emerging economies, will drive above-trend demand growth for ethylene over the next 5–10 years.
- US has a sustainable production cost advantage — LyondellBasell will benefit from cheap natural gas-based feedstock (US ethane of ~$0.45–0.55/gallon) and vertical integration.
- If ethane is truly oversupplied, it could trend toward $0.30–0.35/gal over time (our bull case).

Risks

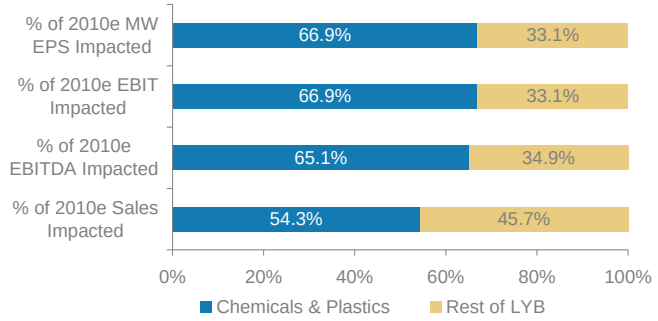
- 2H10 pressure on polyethylene as Middle East capacity comes online.
- Inability to price ahead of commodity cost inflation.
- Natural gas / ethane rallies relative to crude oil, hurting the US advantage.
- Macroeconomic weakness. A sharp economic slowdown in China would likely result in reduced demand for petrochemicals and less of a cost-advantage (from cheaper oil), both of which would hurt LyondellBasell the most.

Potential Catalysts

- Global polyethylene price changes and US ethane price, especially in late 2010/early 2011.
- Reduced interest payments as high-interest debt becomes callable in mid-2013.

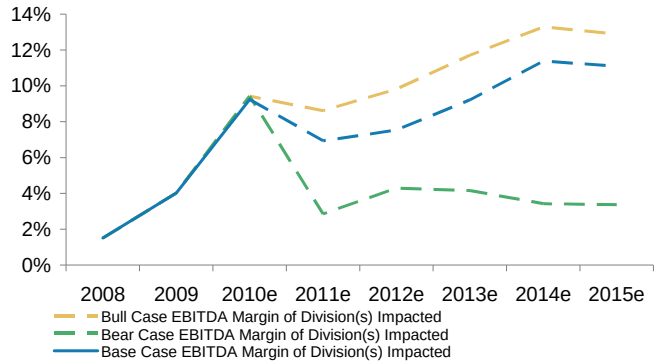
Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 106
How Relevant Is Our Analysis to LyondellBasell?



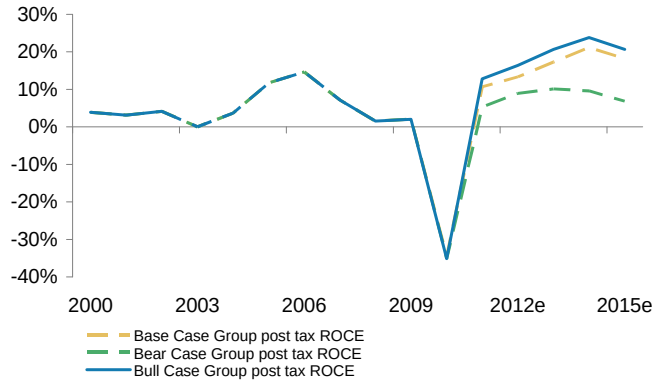
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 107
BBB Case Sales & EBITDA in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 108
BBB Case Group Post-Tax ROCE



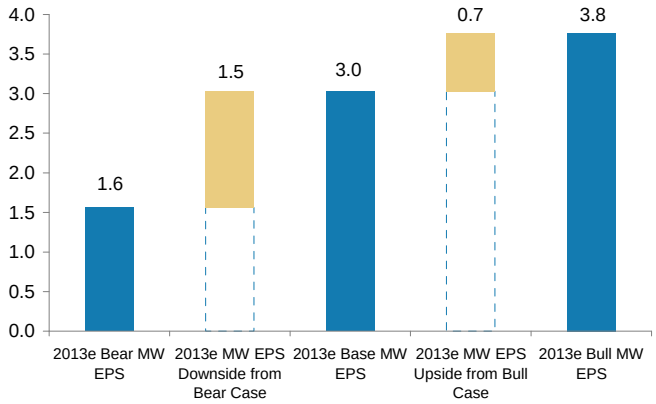
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 109
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-48.5%	1.6	3.0	3.8	24.2%
PER @ Current Share Price		**17.3**	**8.9**	**7.2**	
Impact on PT under Bear/Bull Assumptions		-13.1		6.5	
Base Case PT			37.0		
Impact on Base Case PT (%)		-35.4%		17.7%	

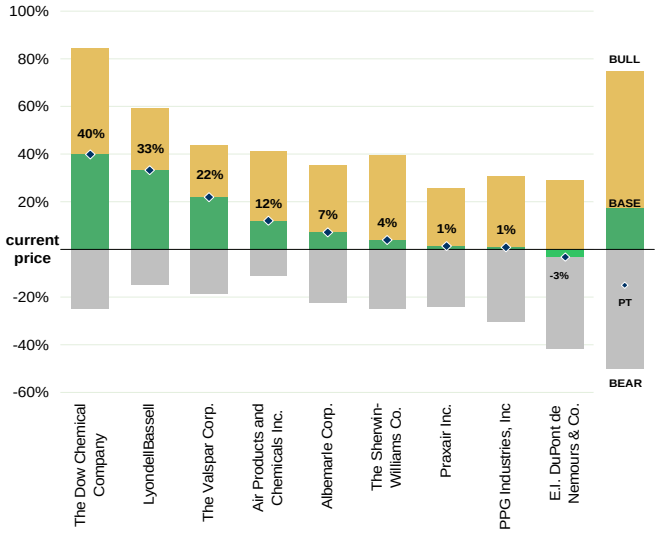
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 110
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

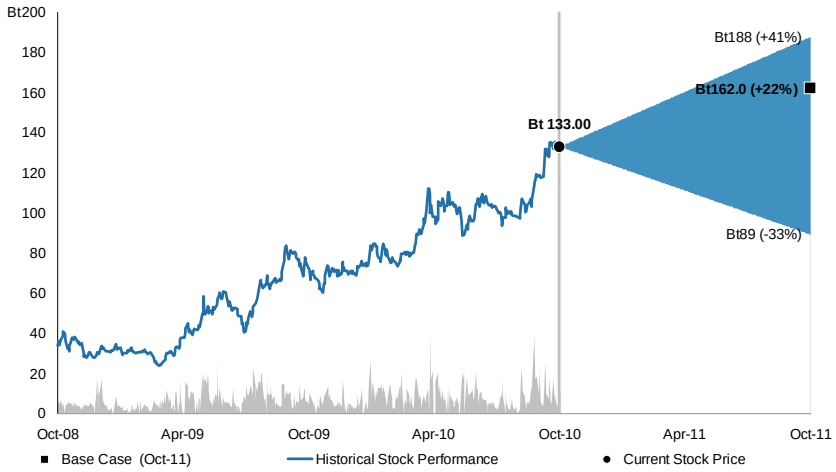
Exhibit 111
How LyondellBasell R/R Sits vs. US Peers



Source: Morgan Stanley Research estimates
For valuation methodology and risks associated with any price targets above, please email morganstanley.research@morganstanley.com with a request for valuation methodology and risks on a particular stock.
Please note that all important disclosures including personal holdings disclosures and Morgan Stanley disclosures appear on the Morgan Stanley public website at www.morganstanley.com/researchdisclosures.

PTT Chemical Public Co. (PTTC.BK, Bt133, Overweight, Price Target Bt162)

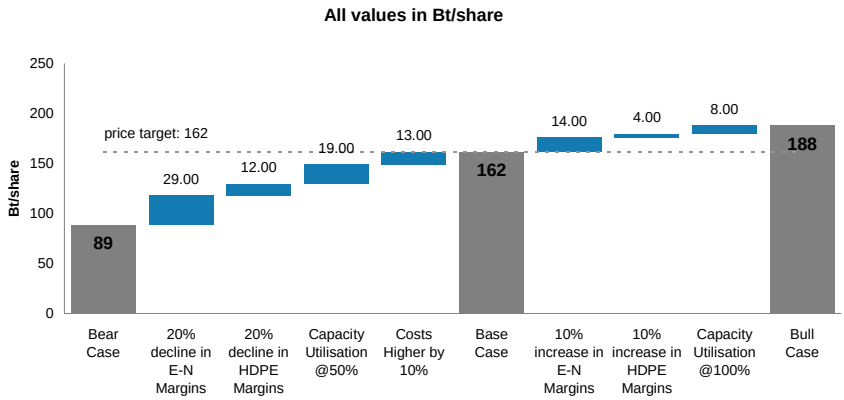
Risk-Reward View – Gas Feedstock Advantage



Source: FactSet, Morgan Stanley Research

Price Target Bt162		EV/EBITDA of 7.0x, the average for global petrochemicals companies (PTTCH has historically traded in line global comps); EBITDA of 1 full year of operations for the new 1 mntpa cracker.
Bull Case Bt188	10.5x Bull Case 2011 EPS	**Rising prices as supply falls amid strong demand:** Ethylene prices increase 10% as supply pressure eases for Asia and Middle East. HDPE–naphtha spread increases 10%. Capacity utilization rises to 100% on strong demand.
Base Case Bt162	12x Base Case 2011 EPS	**Low costs:** Ethylene prices of US$1065/ton and E-N spread of US$327/ton in 2011. HDPE–ethylene spread of US$115/ton. Operating cost of US$180/ton for the gas cracker. 85% cracker utilization in 2011 as PTTCH cracker starts operations in 1Q11.
Bear Case Bt89	10x Bear Case 2011 EPS	**Oversupply amid weak demand:** Ethylene prices decline 20% due to supply pressure for Asia and Middle East. HDPE–naphtha spread declines 20%. Costs increase 10%. Capacity utilization declines to 50% as PTT's GSP startup gets delayed, leading to lower feedstock supplies.

From Bear to Bull: Leveraged Play on Petrochemical Prices



Source: Morgan Stanley Research

Investment Thesis

- PTTCH offers an attractive risk-reward profile: Its structural cost advantages and expansion plans more than offset risks from low ethylene utilization rates in the medium term and new capacity expansions globally that benefit less from cheap ethane, in our view.
- Large gas-based cracker: PTTCH is the largest gas cracker in Thailand, and one of the largest in Asia. It thus has significant economies of scale, reducing its operating costs/ton.
- PTTCH has low operating and processing cost of US$150/ton.
- Strong balance sheet.

Key Value Drivers

- Ethylene prices and resulting margins.
- Capacity utilization.
- Operating costs.

Risks

- Netback volatility: Global petrochemical margins are cyclical and volatile, so PTTCH's earnings, too, may correlate with sector cyclicality.
- Increased Middle Eastern capacity could pressure PTTCH's margins, especially if demand growth declines over the long term.
- Ma Tha Phut pollution issue could hamper production growth in 2011.
- PTTCH's advantaged feedstock position could deteriorate with low crude oil prices.

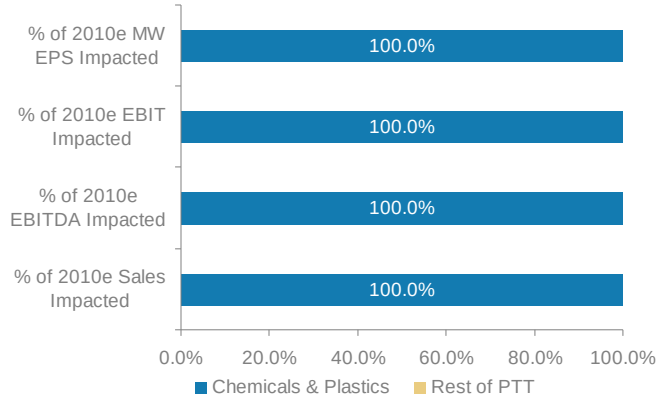
Potential Catalysts

- Higher global demand should lead to improved margins for PTTCH.
- Startup of GSP 6 should help PTTCH's cracker utilization rise to 100%.
- Clarity on the Ma Tha Phut pollution issue should help PTTCH start its downstream polymer and MEG capacity.

Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 112

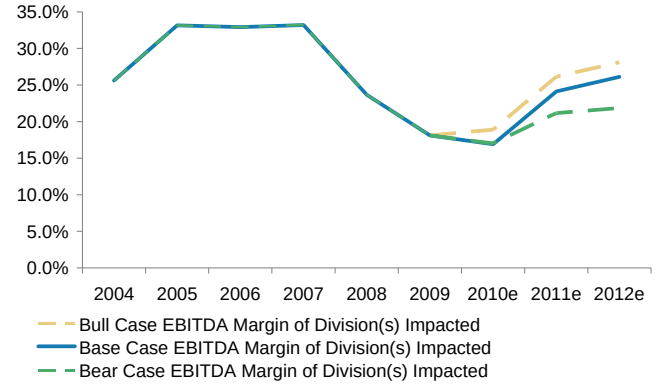
How Relevant Is Our Analysis to PTT Chemicals?



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 113

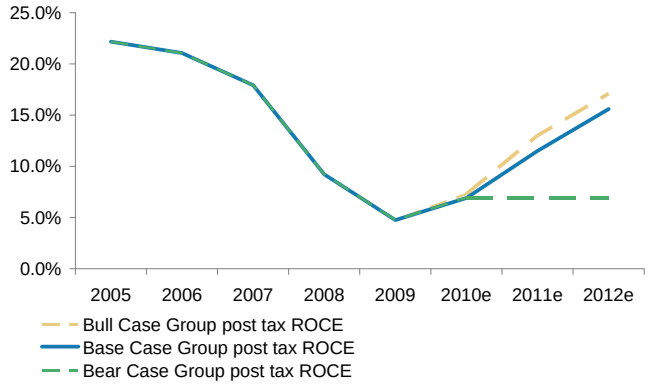
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 114

BBB Case Group Post-Tax ROCE



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 115

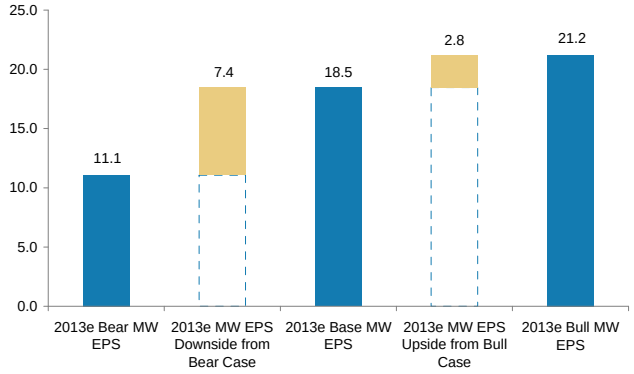
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-40.0%	11.1	18.5	21.2	15.0%
PER @ Current Share Price		**12.2**	**7.3**	**6.3**	
Impact on PT under Bear/Bull Assumptions		-53.9		20.2	
Base Case PT			162.0		
Impact on Base Case PT (%)		-33.2%		12.5%	

Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 116

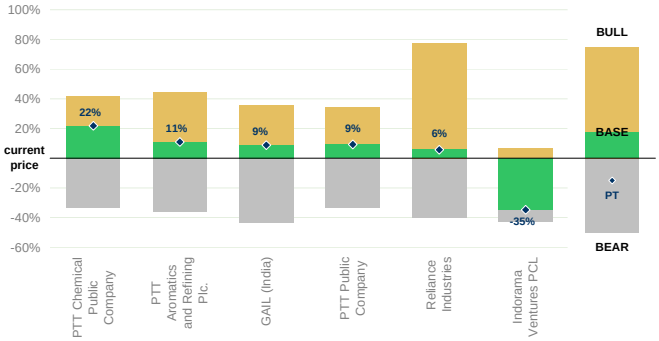
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 117

How PPT R/R Sits vs. India and Thailand Peers



Source: Morgan Stanley Research estimates

For valuation methodology and risks associated with any price targets above, please email morganstanley.research@morganstanley.com with a request for valuation methodology and risks on a particular stock.

Please note that all important disclosures including personal holdings disclosures and Morgan Stanley disclosures appear on the Morgan Stanley public website at www.morganstanley.com/researchdisclosures.

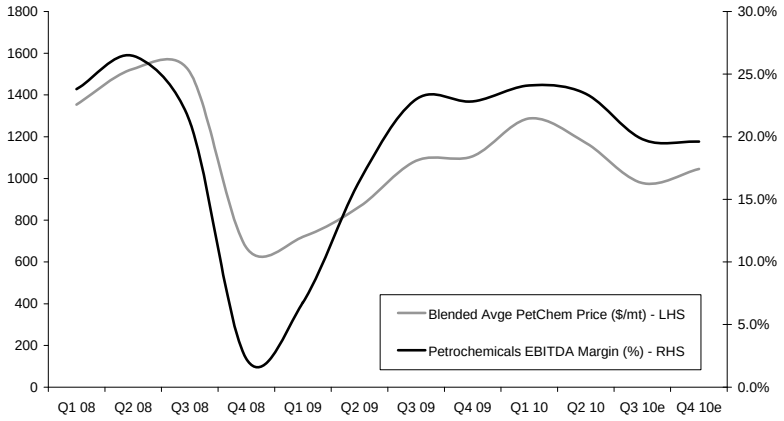
SABIC (2010.SE, SAR90, Overweight, Price Target SAR115)

Risk/Reward Remains Favourable as Upgrades Continue to Surprise

Source: FactSet , Morgan Stanley Research

Price Target SAR115		Based on DCF (WACC 10.1%, terminal growth of 1.7%), residual income (same assumptions), mid-cycle valuation (EBITDA margin of 36% and EV/EBITDA multiple of 7.4x) and DDM model (CoE of 11.4% and long-term dividend growth of 9.2%).
Bull Case SAR155	8.7x 2012e EPS SAR17.75	**Supercycle arrives.** Global ethylene utilization rates reach 94% in 2012, rising to 98% by 2014. Margins in SABIC's Chemicals division rise to new highs on rising petrochemical margins.
Base Case SAR115	16.3x 2010e EPS SAR7.05 11.3x 2012e EPS SAR10.17	**Expansion drives growth, lower peak margin as cost advantage diluted.** 2010–15e CAGR in group sales of 5.2%, driven by capacity expansions and rising petrochemical prices. EBITDA margins trough at 29% in 2009 and peak at 39% in 2014, below 2005's peak of 44% (34% in terminal year).
Bear Case SAR78	9.6x 2012e EPS SAR8.17	**Modest recovery leaves utilization rates declining.** Increased capacity in 2011, coupled with weak demand, causes ethylene utilization rates to fall to 82%. Prices subsequently fall, before modest recovery from 2012-onward.

Further Margin Expansion in Margins in Petrochemicals Division Should Be Closely Correlated to Improvements in Asian Petrochemical Pricing



Source: Morgan Stanley Research e = Morgan Stanley Research estimates

Investment Thesis

- SABIC offers an attractive risk-reward profile as its structural cost advantage and expansion plans more than offset risks associated with low ethylene utilization rates medium term and new capacity expansions benefitting less from cheap ethane.
- Asian petchem. Prices are rising once more (+13% from recent lows); this, along with volume growth from Yansab and Sharq, will drive rising net income medium term.
- Our EPS forecasts are 5–10%+ ahead of consensus; we believe the equity market is failing to reflect the value of SABIC's capex-driven growth (~9% p.a. 2010–13e).
- Market fears continue to focus on the risk of moderating petrochemical prices as new ethylene capacity is ramped up through 2010. However, this is in our estimates, and current channel checks suggest new Chinese capacity in particular could be suffering delays due to power and water outages and shortages.

Key Value Drivers

- Petrochemical prices are critical to margins. Higher ethylene prices drive higher returns, which in turn drive SABIC's share price.
- Capex is key. Capacity additions will be essential to keeping SABIC's impressive growth trajectory on track. It plans to increase capacity by ~8% p.a. in petchems by 2020.

Risks

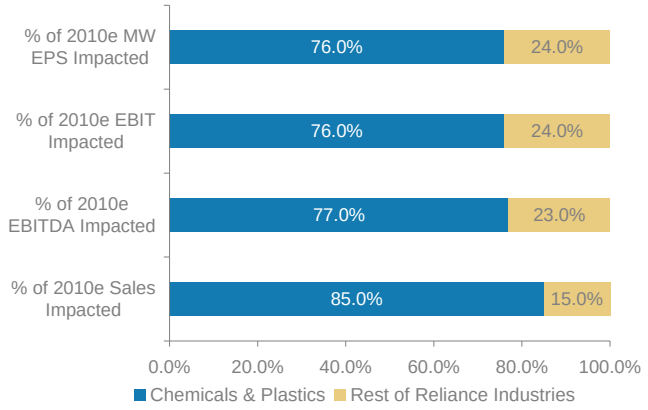
- Weak ethylene demand.

Potential Catalysts

- 3Q results — October 2010.
- Kayan ramp-up expected — 2H10.
- Rising oil price.
- Asian petchem price recovery.
- Potential acquisitions — 2H10.

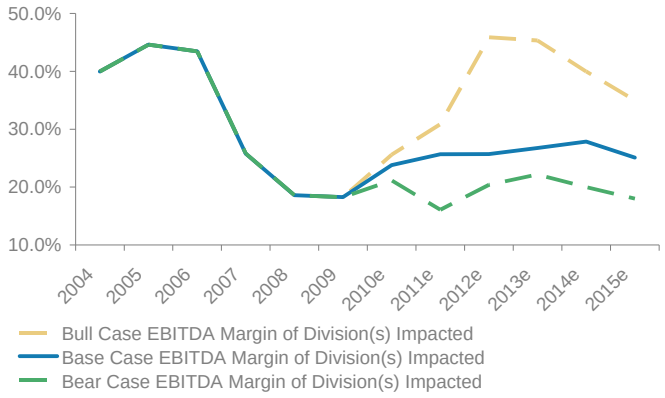
Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 118
How Relevant Is Our Analysis to SABIC?



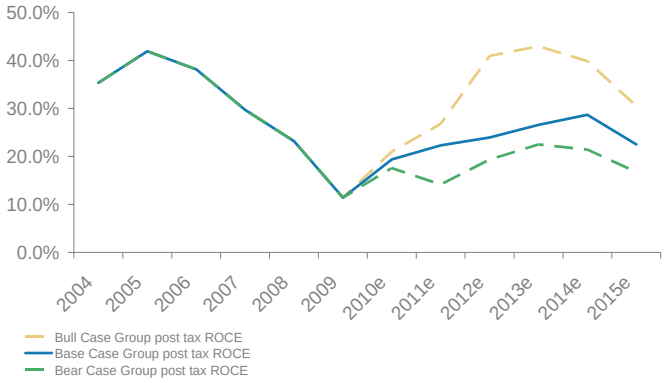
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 119
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 120
BBB Case Group Post-Tax ROCE



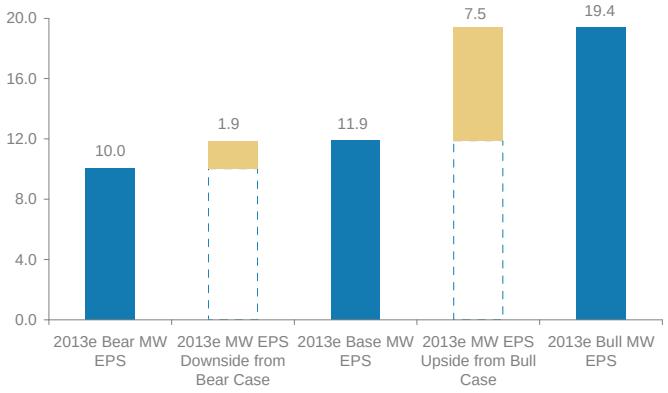
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 121
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-15.6%	10.03	11.89	19.42	63.3%
PER @ Current Share Price		**8.9**	**7.5**	**4.6**	
Impact on PT under Bear/Bull Assumptions		-14.0		56.9	
Base Case PT			115.0		
Impact on Base Case PT (%)		-12.2%		49.4%	

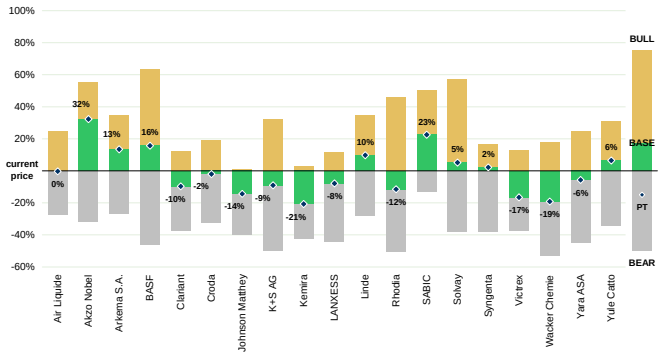
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 122
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

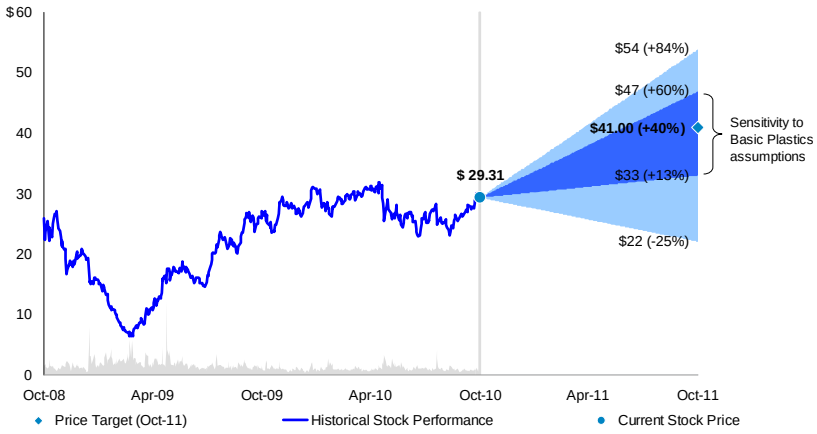
Exhibit 123
How SABIC R/R Sits vs. Europe Peers



Source: Morgan Stanley Research estimates estimates
For valuation methodology and risks associated with any price targets above, please email morganstanley.research@morganstanley.com with a request for valuation methodology and risks on a particular stock.
Please note that all important disclosures including personal holdings disclosures and Morgan Stanley disclosures appear on the Morgan Stanley public website at www.morganstanley.com/researchdisclosures.

Dow Chemical Co. (DOW, $29, Overweight, Price Target $41)

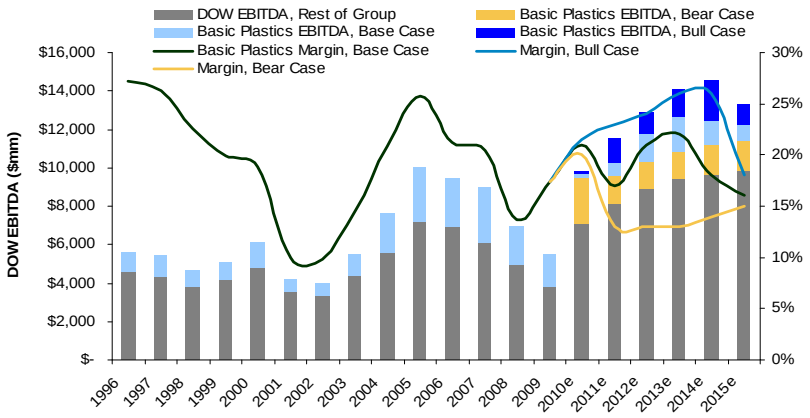
Downside Risk Limited by Portfolio Shift and Feedstock Advantage



Source: FactSet , Morgan Stanley Research

Price Target $41		Based on a average of DCF ($45), mid-cycle P/E ($42), and dividend discount model ($40). We assume a mid-cycle P/E multiple of 15x (in line with historical average), WACC of 7.7%, cost of equity of 10.9%, and long-term growth of 1.0%.
Bull Case $54	13.3x Bull Case 2011 EPS of $4.05	**Strong cyclical recovery, and cheap ethane.** Operating rates and plastics margins improve further from current levels, driving ~$6 of upside. Strong growth in the solar market. Share gains in seeds and traits. Solid auto and housing recovery.
Base Case $41	15.6x Base Case 2011 EPS of $2.63	**Base case of 4% global GDP growth; normalized basic plastics margin of 16%.** Weak housing starts but strong industrial growth over the next 2 years. Plastics margins decline before recovering to higher levels (but below previous peak).
Bear Case $22	15.1x Bear Case 2011 EPS of $1.46	**Economic growth disappoints.** Plastics margins depressed by weak demand and new Middle East/Asian supply, which drives ~$8 of downside. Anemic final demand weighs on margins, and new product introductions disappoint.

Basic Plastics Represents 35% of Dow Profits



Source: Company Data, Morgan Stanley Research e = Morgan Stanley Research estimates
Historical data is pro-forma for DOW / ROH merger

Investment Thesis

- Best positioned for cyclical recovery; non-cyclical earnings drivers provide downside protection to our above-consensus EPS.
- Market underestimates innovations in Dow Agrosciences (the launch of SmartStax will have a material effect on Dow) and Advanced Materials (solar shingles and diesel particulate filters represent potentially disruptive technologies and large opportunities).
- Operating and financial leverage drives EPS growth, with 40% EBIT growth yields 85% EPS growth.

Leveraged to Cheap US Ethane

- Ethylene economics — key drivers are 1) global supply/demand and 2) local feedstock costs. Our view: Dow will benefit from cost-advantaged feedstock (US ethane of ~$0.45–0.55/gallon) and vertical integration.
- Can Dow pass on pricing and protect margins amid inflation? Our view: Dow can price ahead of raw material costs, especially its specialty applications. New, higher-quality products should help margins, and reduce cyclicality.

Risks

- 2H10 pressure on polyethylene as Middle East capacity comes online.
- Inability to price ahead of commodity cost inflation.
- Natgas rallies relative to crude oil.
- Macroeconomic weakness.

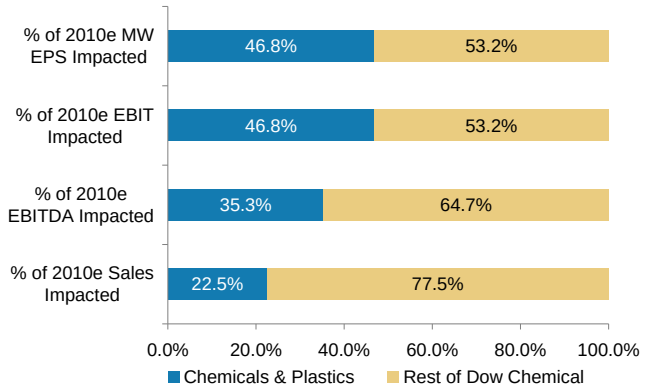
Potential Catalysts

- Global polyethylene price changes and US ethane price, especially in late 2010/early 2011.
- Positive/negative macro data: The key share price driver will likely be continued evidence of an economic recovery leading to consensus EPS upgrades.
- News flow on potential divestitures.

Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 124

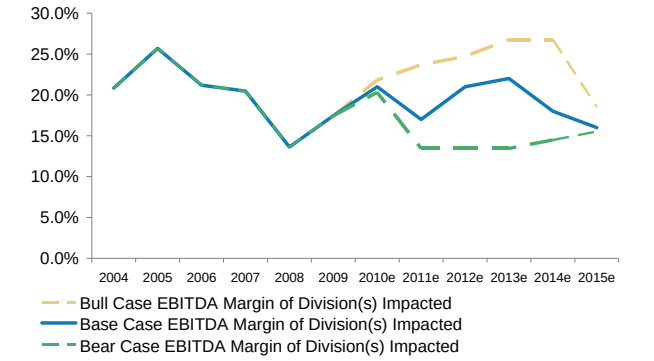
How Relevant Is Our Analysis to Dow Chemical?



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 125

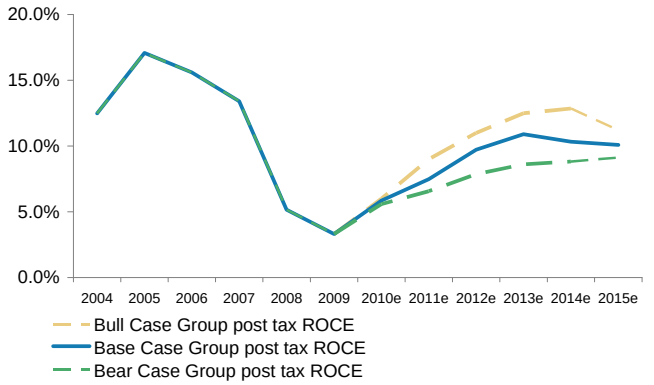
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 126

BBB Case Group Post-Tax ROCE



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 127

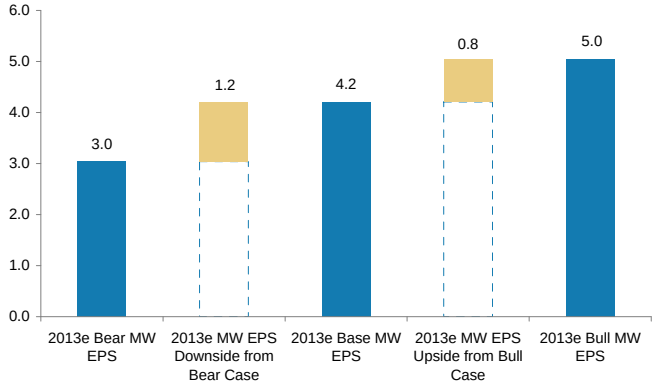
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-27.9%	3.0	4.2	5.0	19.9%
PER @ Current Share Price		9.5		5.7	
Impact on PT under Bear/Bull Assumptions		-8.1		5.8	
Base Case PT			41.0		
Impact on Base Case PT (%)		-19.7%		14.0%	

Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 128

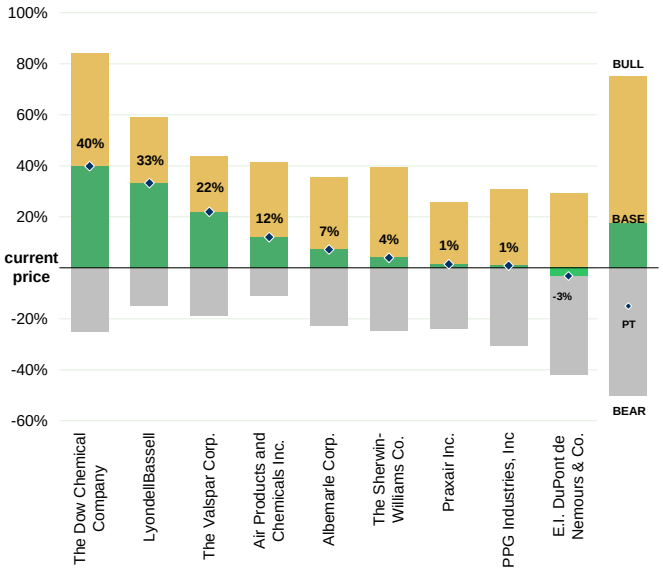
Bear to Base to Bull Case MW EPS bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 129

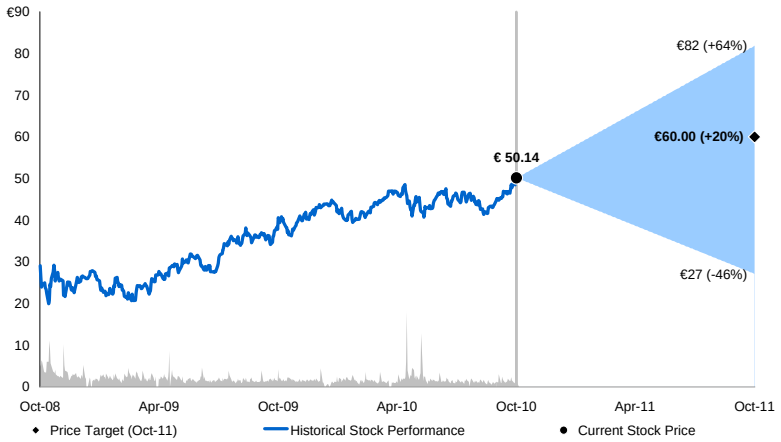
How Dow R/R Sits vs. US Peers



Source: Morgan Stanley Research estimates
For valuation methodology and risks associated with any price targets above, please email morganstanley.research@morganstanley.com with a request for valuation methodology and risks on a particular stock.
Please note that all important disclosures including personal holdings disclosures and Morgan Stanley disclosures appear on the Morgan Stanley public website at www.morganstanley.com/researchdisclosures.

BASF (BASF.DE, €50, Overweight, Price Target €60)

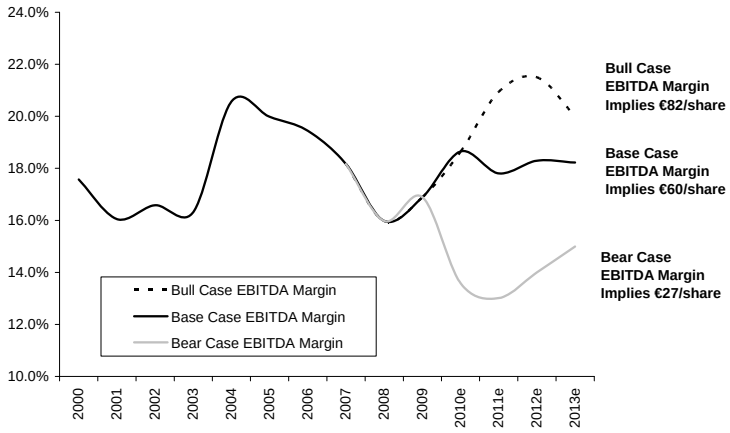
Risk-Reward View: Pace of Recovery and Oil Price Dictate Fair Value



Source: FactSet, Morgan Stanley Research

Price Target €60		Based on the average of RI (WACC 7.6%, LT growth 0.9%), SOP, DCF (WACC 7.6%, LT growth 0.9%), and DDM (COE 8.9%).
Bull Case €82	11.8x Bull Case Adj. 2011 EPS of €6.94	**Strong volume recovery, oil price rising, 10% buyback:** 10% volume growth in 2010 and 2011. BASF delivers full synergies and cost saves by year-end 2011. Oil price rises to $120/bbl. 10% buyback programme. Peak 2011 EBITDA margin of 20.9%.
Base Case €60	11.9x Base Case Adj. 2011 EPS of €5.03	**Modest recovery, reasonable pricing power:** BASF delivers a 12.0% volume recovery in 2010, with a further 6.0% in 2011. Selling prices rise 9.5% in 2010, helping to manage cost inflation. Oil price averages $80/bbl in 2010. BASF delivers a 2011 EBITDA margin of 17.8%.
Bear Case €27	13.6x Bear Case Adj. 2011 EPS €1.98	**Double-dip scenario:** Volumes collapse 2H10, and decline 5% in 2011. Prices rise just 3.5% as pricing power fails and gross margin falls. Cost savings and synergies fail, oil price stagnant at $65/bbl in 2011. BASF delivers a 2011 EBITDA margin of 13.9%.

Bear to Bull: Operating Leverage and Oil Price Are Key



Source: FactSet, Morgan Stanley Research e = Morgan Stanley Research estimates

Investment Thesis

- Valuation does not reflect the transformation of the portfolio and returns through the cycle.
- We believe BASF will deliver recovery revenue growth (and EPS) that surprises on the upside.
- Upstream chemicals and plastics cash margins currently strong despite the rising input cost environment.
- BASF's E&P business is set to benefit from a rising oil price, increasing gas volumes from Russia, and rising returns as its tax liability declines, with Libyan oil becoming less important.
- Gas distribution & trading will see volume growth as Nord Stream comes online from late 2011.
- BASF looks inexpensive, trading at a 2010e P/E of 10.0x and EV/EBITDA of 5.4x, with a 2011e dividend yield of 4.4%.

Key Value Drivers

- The oil price, industrial production.
- Capex programmes, especially Nord Stream (€1.5 bn) and Nanjing (€1 bn) Verbund expansion.
- Upside from €1.1 bn of residual cost saves and Ciba synergies.
- BASF's Verbund structure.

Risks

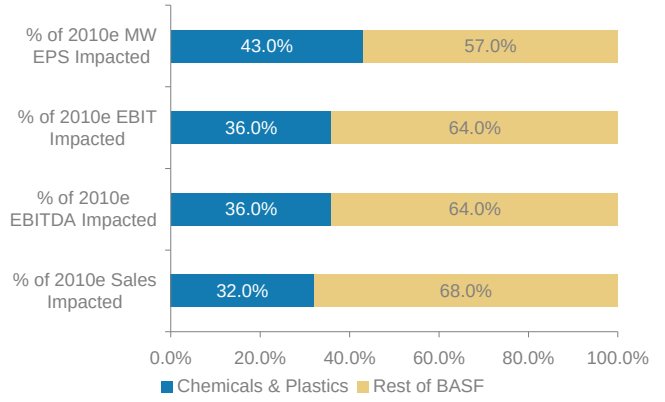
- Execution cost savings, synergies.

Potential Catalysts

- 3Q results — late October 2010.
- Possible Styrenics disposal — 2010/11.
- Announcements of new oil and gas discoveries by Revus in Northern Europe — 2010/11.
- Further rises in the oil price — 2010/11.
- Increases in cost saving and Ciba synergy targets — 2010/11.
- Nord Stream launch — late 2011.

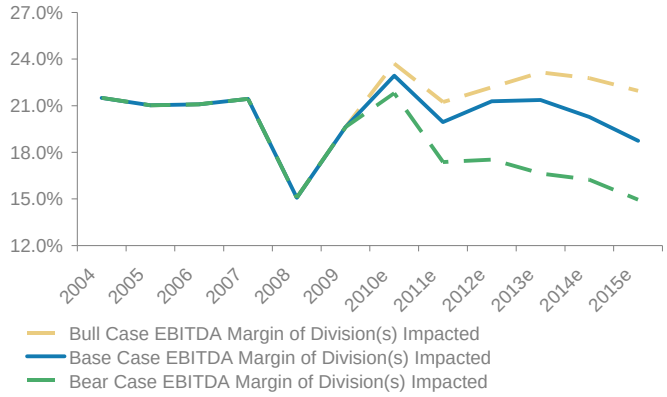
Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 130
How Relevant Is Our Analysis to BASF?



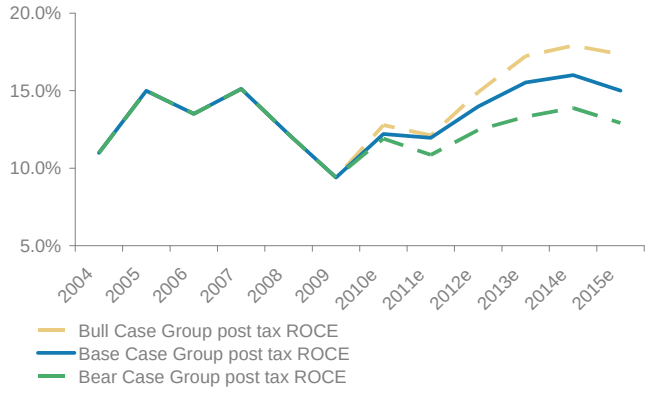
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 131
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 132
BBB Case Group Post-Tax ROCE



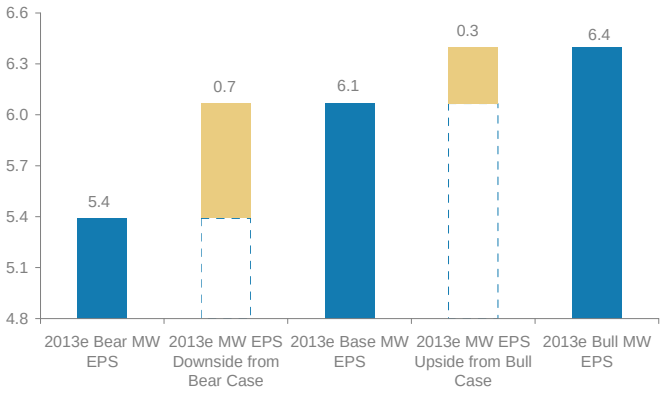
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 133
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-11.1%	5.39	6.07	6.40	5.5%
PER @ Current Share Price		**9.3**	**8.3**	**7.8**	
Impact on PT under Bear/Bull Assumptions		-5.6		2.8	
Base Case PT			60.0		
Impact on Base Case PT (%)		-9.3%		4.6%	

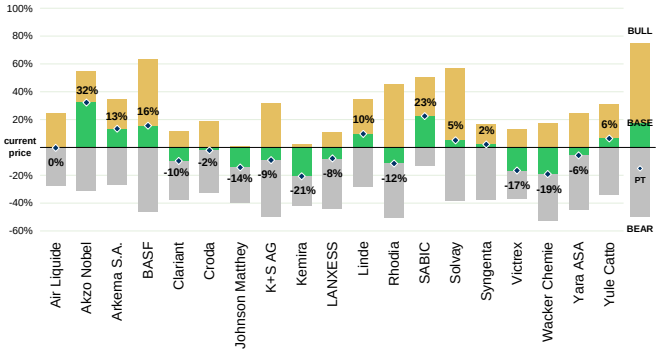
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 134
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

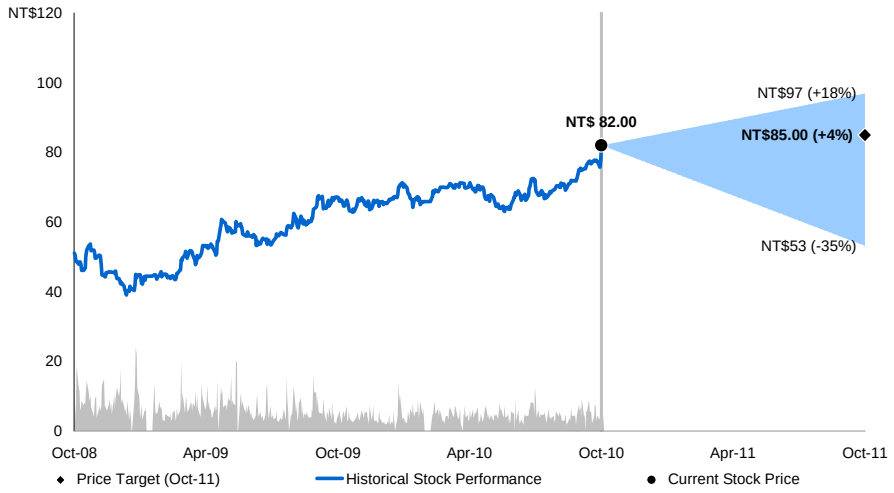
Exhibit 135
How BASF R/R Sits vs. Europe Peers



Source: Morgan Stanley Research estimates estimates
For valuation methodology and risks associated with any price targets above, please email morganstanley.research@morganstanley.com with a request for valuation methodology and risks on a particular stock.
Please note that all important disclosures including personal holdings disclosures and Morgan Stanley disclosures appear on the Morgan Stanley public website at www.morganstanley.com/researchdisclosures.

Formosa Plastics (1301.TW, NT$82, Overweight, Price Target NT$85)

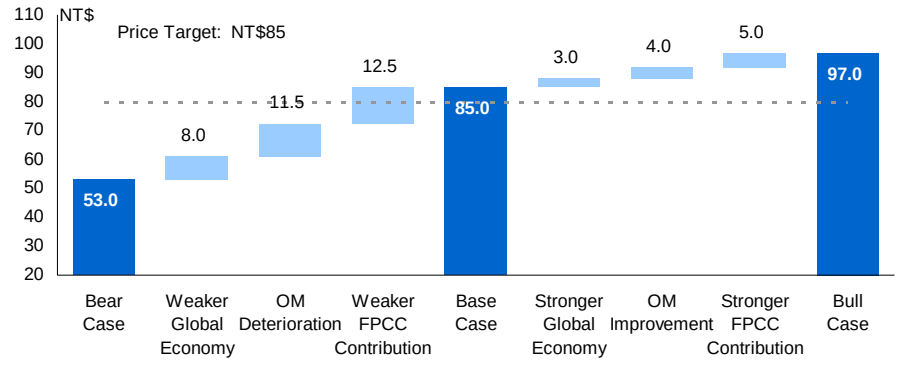
Risk-Reward View: 4% Upside from Current Level



Source: FactSet, Morgan Stanley Research

Price Target NT$85		Sum-of-the-parts: We use a 9.0x 2011e EV/EBITDA to value the core business and mark to market the value of Formosa Sumco.
Bull Case NT$97.0	Implies 2.4x 2011e BV	**Strong demand as global economy rebounds; 50% of scheduled capacity expansion in Middle East online:** Stronger-than-expected global economic growth; 2010 operating margin further expands to 12.5%, and bull case scenario for FPCC earnings.
Base Case NT$82.0	Implies 2.1x 2011e BV	**Demand outlook improves; 70% of scheduled capacity expansion in Middle East online:** Global economy demonstrates mild recovery; 2010 operating margin of 10.0%, and base case scenario for FPCC.
Bear Case NT$53.0	Implies 1.3x 2010e BV	**Further deterioration in global economy; 100% of scheduled capacity expansion in Middle East online:** weaker-than-expected global economic growth; 2010 operating margin deterioration to 6.5%, and bear case scenario for FPCC.

Operating Margin and FPCC Contribution Are Key Value Drivers



Source: Morgan Stanley Research

Investment Thesis

- Stronger-than-expected specialty margins and equity investment income from FPC's China and US subsidiaries in the next 1–2 quarters could offset the downfall in FPCC's equity investment income and polyolefin margins.
- While we expected abundant ethylene supply would pressure petrochemical spreads, we now think the margin risk may not materialize until 2011.

Key Value Drivers

- Global GDP growth: Chemical demand is closely tied to economic trends and growth.
- Improvement in core operating margin.
- Contribution from FPCC, FPC's key subsidiary, remains significant and should grow in importance.

Risks

- Sudden weak demand in specialty chemicals.
- Deterioration in macro environment.
- High volatility of crude oil and chemical prices.

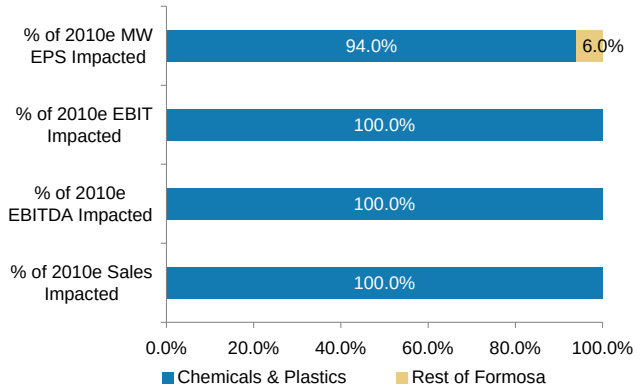
Potential Catalysts

- Strong demand for electronic-use specialty chemicals in 2H10.
- More PVC capacity shutdown.
- Stronger-than-expected demand from China.

Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 136

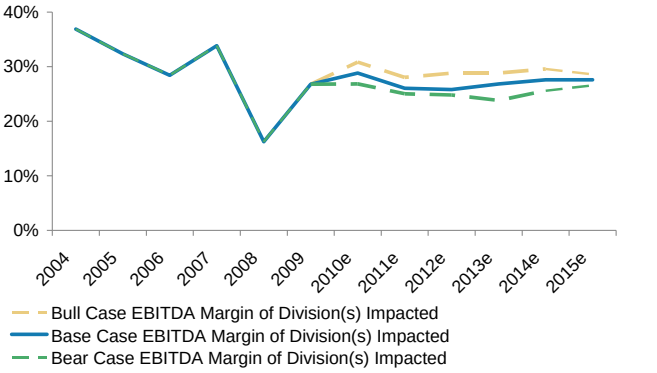
How Relevant Is Our Analysis to Formosa Plastics?



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 137

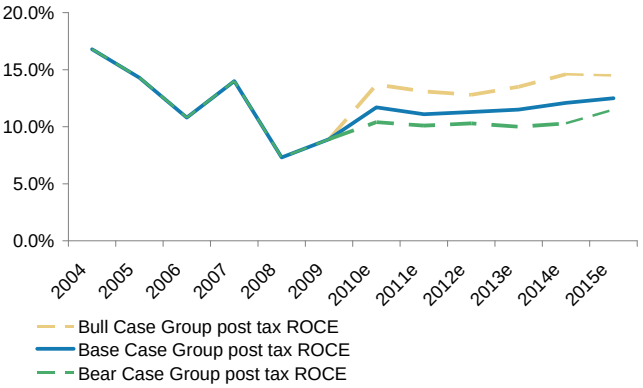
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 138

BBB Case Group Post-Tax ROCE



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 139

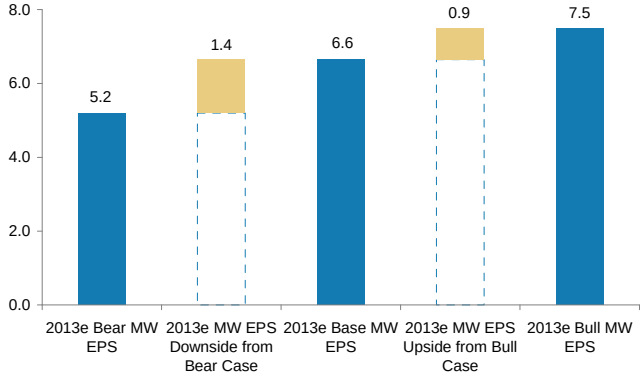
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-21.8%	5.2	6.6	7.5	12.8%
PER @ Current Share Price		**14.9**	**11.7**	**10.3**	
Impact on PT under Bear/Bull Assumptions		-16.9		10.0	
Base Case PT			85.0		
Impact on Base Case PT (%)		-19.8%		11.7%	

Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 140

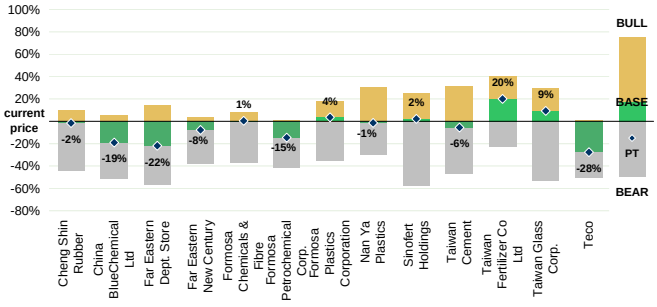
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 141

How Formosa R/R Sits vs. Taiwan Peers



Source: Morgan Stanley Research estimates

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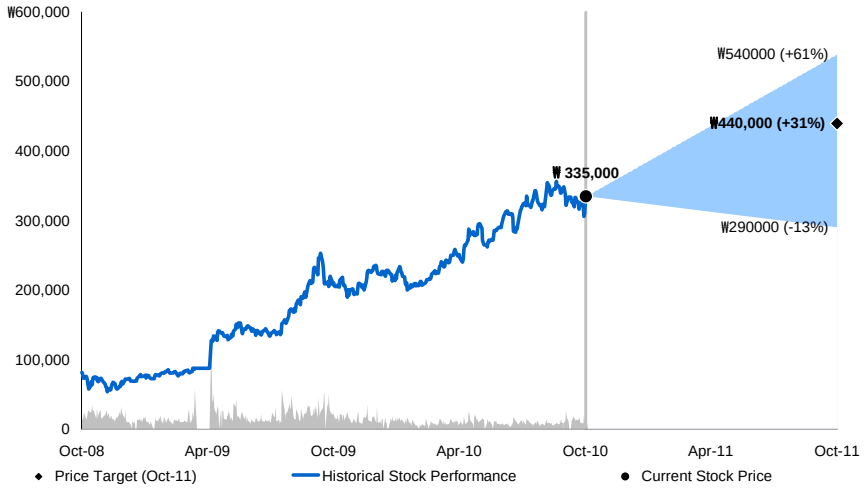
Please note that all important disclosures including personal holdings disclosures and Morgan Stanley disclosures appear on the Morgan Stanley public website at www.morganstanley.com/researchdisclosures.

LG Chem (051910.KS, W335,000, Overweight, Price Target W440,000)

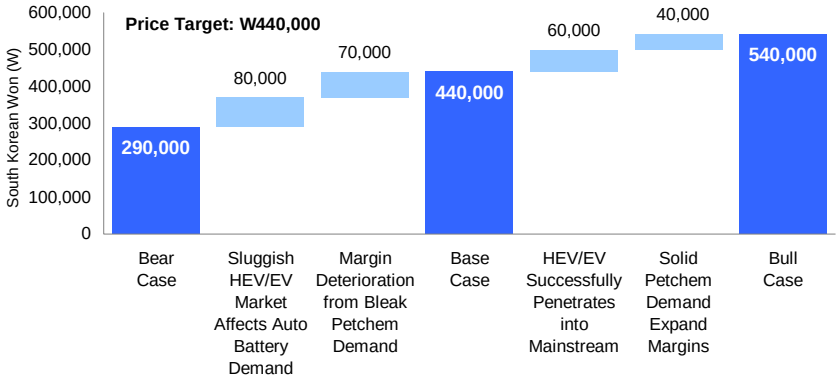
Risk-Reward Skewed to the Upside on Potential New Business Ventures



Source: FactSet , Morgan Stanley Research

Price Target W440,000		Sum-of-the-parts valuation: Operational value at W16.5tr (12.1% cost of equity on residual income), auto battery business value at W11.5tr (11% WACC on DCF), and investment asset at W568bn (BV).
Bull Case W540,000	10.3x 2011e EV/EBITDA	**Robust global recovery and growth under way:** Strong demand for petchem products expands margins, increasing petchem cash margins by 20%, while HEV/EV demand posts 47% CAGR in 2009–18.
Base Case W440,000	8.3x 2011e EV/EBITDA	**Recovery and growth on track:** We assume our base case weighted average petchem spreads of US$441/ton in 2010 and HEV/EV demand posts a 42% CAGR in 2009–18.
Bear Case W290,000	5.4x 2011e EV/EBITDA	**Sluggish global growth affects HEV/EV take-off:** Demand for petchem products dwindles, lowering cash margins by 30%. HEV/EV demand does not take off as well as expected and posts a 34% CAGR in 2009–18.

Petchem Margin Improvements and Auto Battery Demand Growth Are Key



Source: Morgan Stanley Research

Investment Thesis

- We highlight LG Chem's merit as a diversified petrochemical company with further growth potential in its I&E business.
- Despite expected margin corrections for commodity chemicals through 1Q11, LG Chem's exposure to specialty polymers/high-grade products should protect margins.
- Volume increases from capacity expansions and additional orders from clients for polarizer films and small/mid-size rechargeable batteries will continue to lead growth in the I&E business.
- New business ventures, including the construction of its new glass business facilities, are on track.

Key Value Drivers

- Petchem division: Diversified portfolio of chemical products provides 70% of earnings.
- I&E division: Provides growth and downside protection for earnings.
- HEV/EV: Auto battery business will open a new era for LG Chem.

Risks

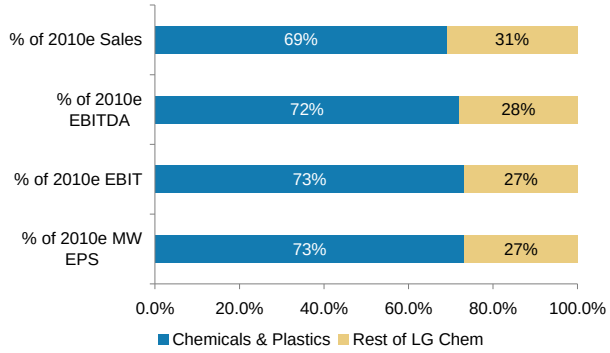
- Weaker-than-expected macro situation pose downside risk.
- Sluggish demand for auto and IT products could lower the share price.

Potential Catalysts

- Petrochem cycle: Expect petchem margin recovery from 2011, along with higher premium-grade mix.
- I&E division: Believed to be one of the next growth drivers; heavy focus on capex in the division has led to solid growth in past years.
- Auto batteries: Additional orders for HEV/EV auto batteries could help boost the stock price.

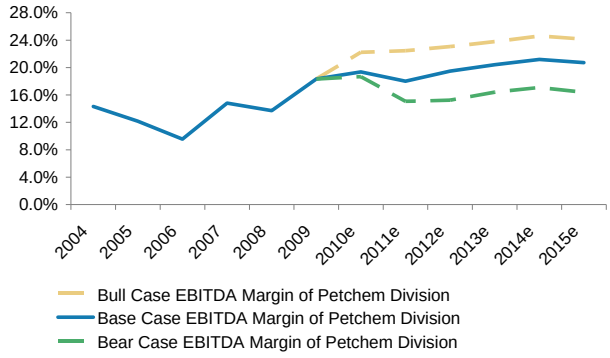
Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 142
How Relevant Is Our Analysis to LG Chem?



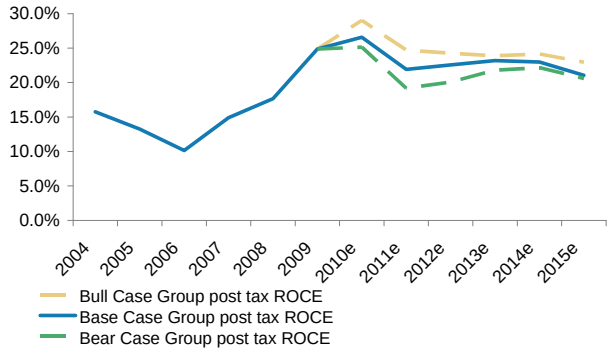
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 143
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 144
BBB Case Group Post-Tax ROCE



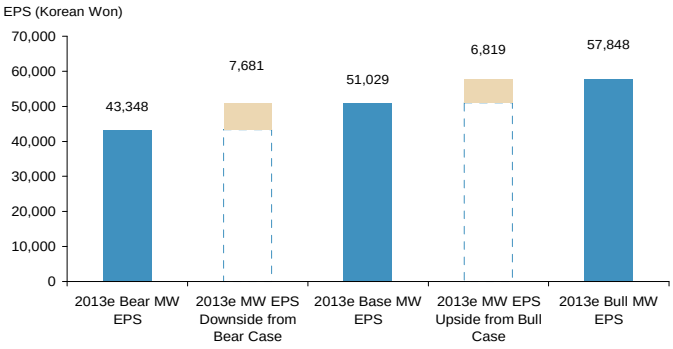
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 145
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-15.1%	43,348	51,029	57,848	13.4%
PER @ Current Share Price		**7.7**	**6.6**	**5.8**	
Impact on PT under Bear/Bull Assumptions		-50,425		44,766	
Base Case PT			440,000		
Impact on Base Case PT (%)		11.5%		10.2%	

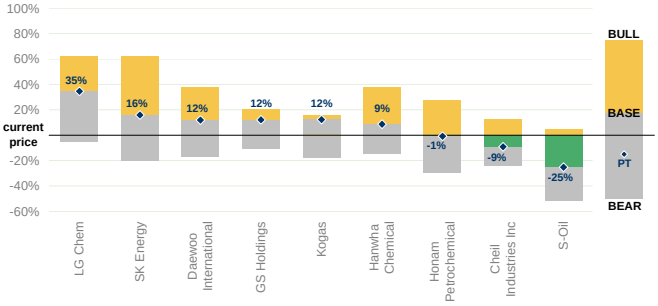
Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 146
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 147
How LG Chem R/R Sits vs. S. Korea Chemical Peers



Source: Morgan Stanley Research estimates estimates
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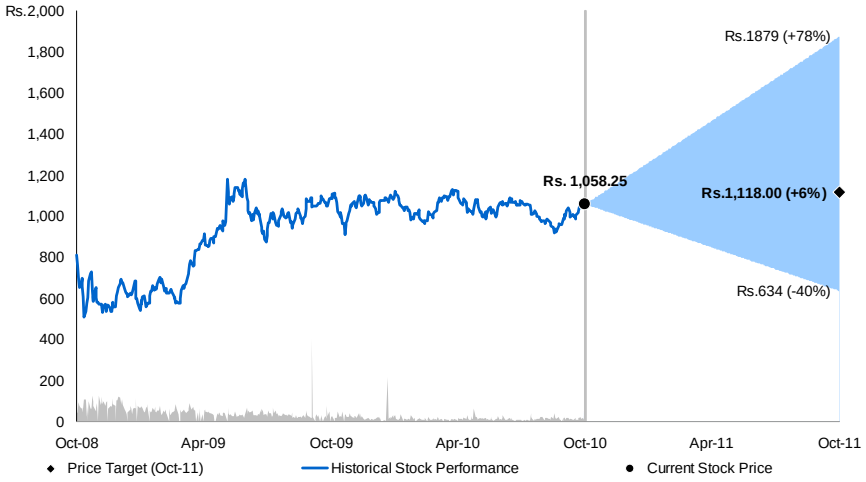
Reliance Industries (RELI.BO, Rs1,058, Overweight, Price Target Rs1,118)

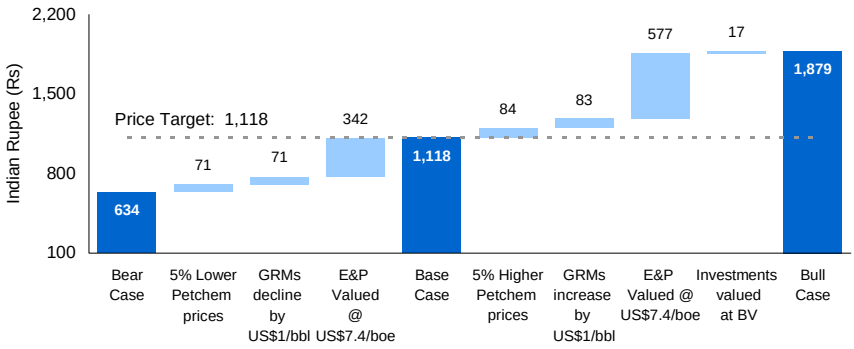
Risk-Reward View: Short Term Headwinds



Source: FactSet, Morgan Stanley Research Note: Historical price data does not reflect the most recent stock split.

Price Target Rs1,118		Sum-of-the-parts: R&M at 6.75x 1-year-forward EV/EBITDA, the avg. of global refining peers; petrochemicals at 7x 1-year-forward EV/EBITDA; E&P at 8.8x P/CEPS (in line with normalized avg. of global companies); investments at 15% discount to F2011e BV.
Bull Case Rs1,879	24x Bull Case F2011 EPS	**Strong recovery and execution:** Refining margins US$1.00/bbl higher than in the base case, reflecting higher petroleum product demand and delays in capacity expansion. Petchem prices 5% higher due to stronger-than-expected petrochemical cycle. E&P business 9bn boe reserves valued at US$9/boe, a 25% discount to average global comps. Investments valued at BV.
Base Case Rs1,118	16.7x Base Case F2011 EPS	**Moderate recovery and good execution:** Refining margins of US$7.7/bbl for F2011. Petrochemical F2011e EBITDA 14% below F2010. E&P business valued at US$7.4/boe.
Bear Case Rs634	11.4x Bear Case F2011 EPS	**Weak economic recovery:** Refining margins US$1.00/bbl lower than in the base case, reflecting lower petroleum product demand. Petchem netbacks 2.5% lower as new capacities come online and supply exceeds demand. Lower gas production amid problems ramping up production.

Bear to Bull Case: E&P to Drive Growth



Source: Morgan Stanley Research

Investment Thesis

- Slowdown of gas ramp-up.
- Lowering our refining business assumptions for RIL on the back of F1Q11 earnings.
- Telecom Foray — not a positive: We believe that RIL's diversification into broadband business is not a positive since competition in the overall telecom space is intense.
- Valuation now less attractive: On F2011 earnings RIL trades at 15.6x P/E and 10x EV/EBITDA, broadly in line with the market but richer than its global peers, which trade at 8x EV/EBITDA and 10–12x P/E.

Key Value Drivers

- Increased reserve base for Reliance's E&P business. RIL aims to have 10 billion boe of reserves and 100 discoveries.
- Reliance's refinery continues posting higher GRMs than peers.
- Should generate steady cash flow of at least US$3–4 billion from F2012e.

Risks

- The stock's historical correlation with the market is 0.85x. Any correction in the market would likely impact RIL.
- A sharp decline in global economic growth that would likely compress our projected petrochemical and refining margins.

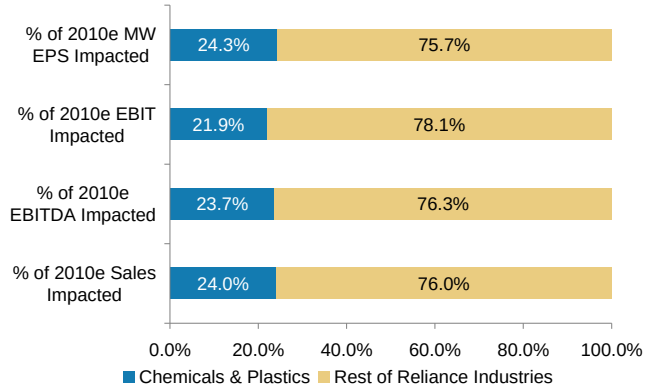
Potential Catalysts

- More news on the E&P business.
- RIL signing gas contracts with various consumers for its entire gas production; higher global refining margins.

Summary of Bull/Base/Bear Analysis on Our Estimates

Exhibit 148

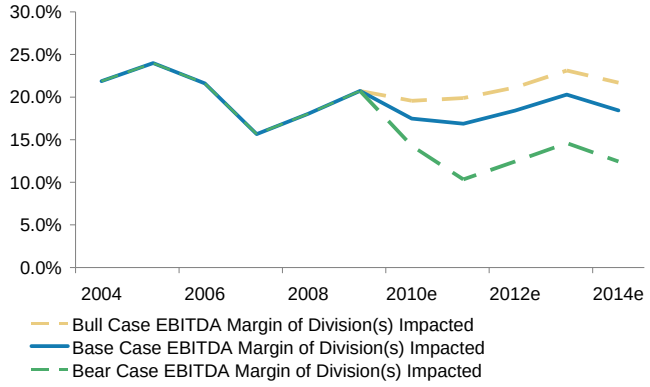
How Relevant Is our Analysis to Reliance?



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 149

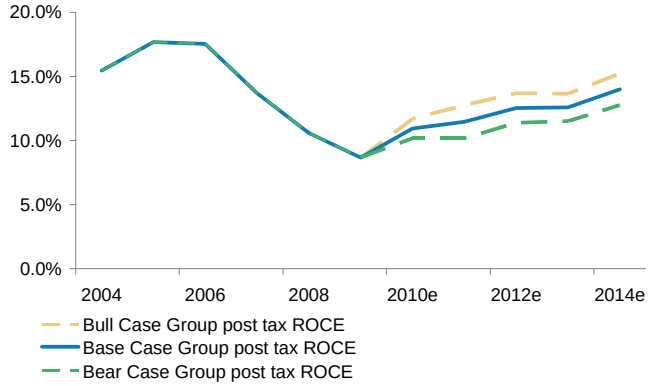
BBB Case EBITDA Margins in Affected Divisions



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 150

BBB Case Group Post-Tax ROCE



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 151

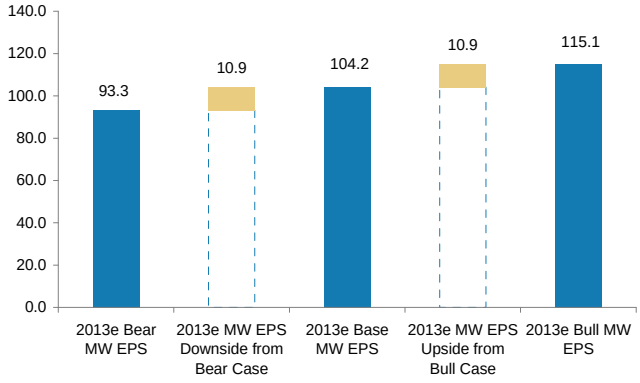
Impact on 2013e EPS on BBB Assumptions

	Bear EPS Downside	Bear	Base	Bull	Bull EPS Upside
2013e MW EPS	-10.4%	93.3	104.2	115.1	10.4%
PER @ Current Share Price		**11.0**	**9.8**	**8.9**	
Impact on PT under Bear/Bull Assumptions		-107.0		107.90	
Base Case PT			1118.0		
Impact on Base Case PT (%)		-9.6%		9.6%	

Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 152

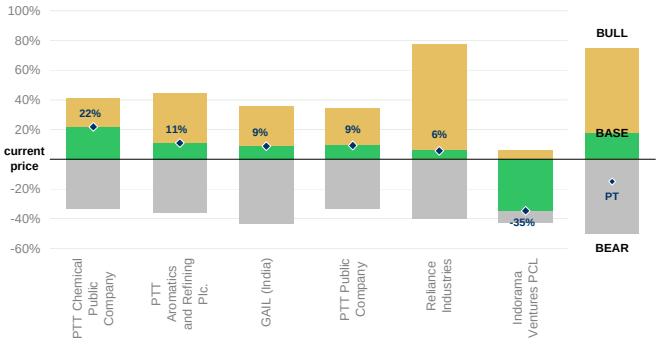
Bear to Base to Bull Case MW EPS Bridge for 2013e



Source: Company data, Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 153

How Reliance R/R Sits vs. India and Thailand Peers



Source: Morgan Stanley Research estimates estimates
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Exhibit 154

Valuation

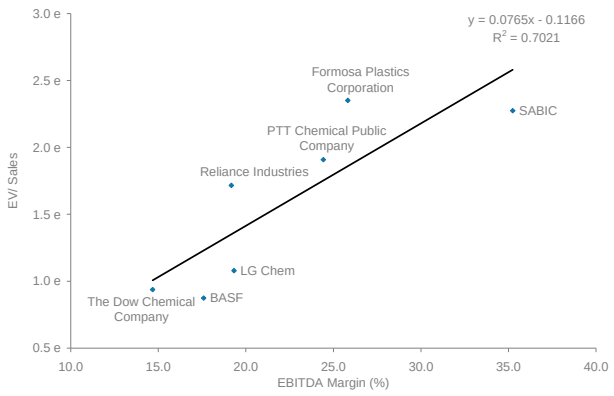
		EV/revenue			Current EV/EBITDA			EV/net operating assets		
Ticker	Company name	2010	2011	2012	2010	2011	2012	2010	2011	2012
BASFn.DE	BASF	1.0 e	0.9 e	0.8 e	5.28 e	4.96 e	4.64 e	1.8 e	1.7 e	1.7 e
1301.TW	Formosa Plastics Corporation	2.5 e	2.4 e	2.3 e	8.90 e	9.20 e	9.00 e	2.0 e	1.9 e	1.9 e
051910.KS	LG Chem	1.2 e	1.1 e	1.0 e	6.35 e	5.80 e	5.08 e	2.9 e	2.3 e	1.9 e
PTTC.BK	PTT Chemical Public Company	2.1 e	1.9 e	1.4 e	12.67 e	8.40 e	6.41 e	1.7 e	1.6 e	1.5 e
RELI.BO	Reliance Industries	1.8 e	1.7 e	NA	10.82 e	9.19 e	NA	2.1 e	1.9 e	NA
DOW.N	The Dow Chemical Company	1.0 e	0.9 e	0.8 e	8.06 e	6.86 e	5.81 e	1.4 e	1.3 e	1.3 e
2010.SE	SABIC	2.5 e	2.3 e	2.1 e	7.58 e	6.37 e	5.69 e	1.7 e	1.6 e	1.5 e

		Price to earnings			EBITDA margin (%)			Return on net operating assets (RNOA)		
Ticker	Company name	2010	2011	2012	2010	2011	2012	2010	2011	2012
BASFn.DE	BASF	11.3 e	11.9 e	10.9 e	18.4% e	17.6% e	17.9% e	18.0% e	17.1% e	18.9% e
1301.TW	Formosa Plastics Corporation	12.5 e	12.9 e	12.3 e	28.3% e	25.8% e	25.6% e	16.9% e	15.9% e	16.2% e
051910.KS	LG Chem	9.9 e	9.1 e	7.8 e	18.6% e	19.3% e	21.3% e	38.9% e	32.9% e	31.6% e
PTTC.BK	PTT Chemical Public Company	19.6 e	11.4 e	7.9 e	17.0% e	24.4% e	26.3% e	7.1% e	11.2% e	15.9% e
RELI.BO	Reliance Industries	17.1 e	14.8 e	NA	17.3% e	19.2% e	NA	9.4% e	10.7% e	NA
DOW.N	The Dow Chemical Company	16.8 e	11.3 e	8.2 e	13.5% e	14.7% e	16.1% e	6.8% e	8.9% e	11.3% e
2010.SE	SABIC	12.7 e	10.2 e	8.8 e	32.9% e	35.2% e	36.7% e	14.2% e	15.9% e	17.1% e

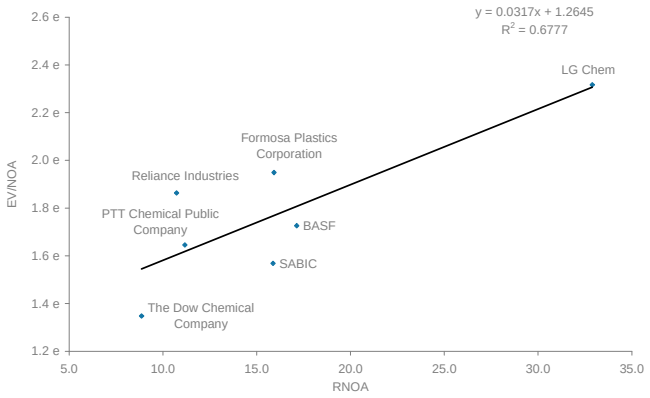
Source: Morgan Stanley Research e = Morgan Stanley Research estimates

Exhibit 155

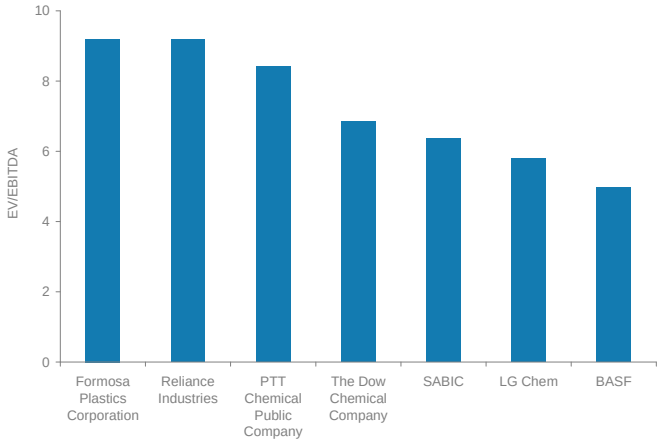
2011e EV Sales



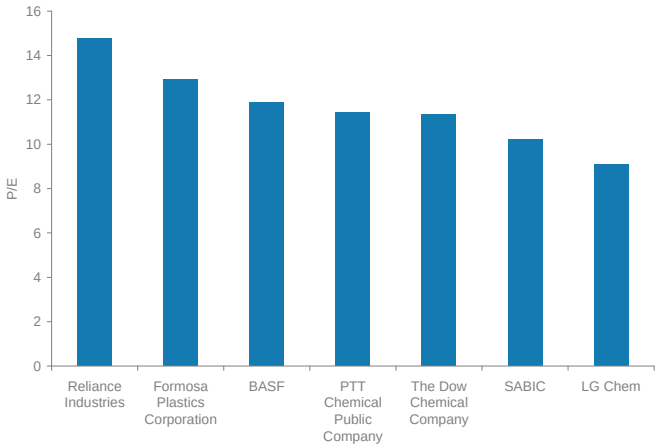
2011e EV NOA



2011 EVe EBITDA



2011e P/E



Source: Morgan Stanley Research e = Morgan Stanley Research estimates

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(as of September 30, 2010)

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Stock Rating Category	Count	% of Total	Count	% of Total IBC	% of Rating Category
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Equal-weight/Hold	**1146**	**43%**	**413**	**45%**	**36%**
Not-Rated/Hold	**14**	**1%**	**4**	**0%**	**29%**
Underweight/Sell	**381**	**14%**	**99**	**11%**	**26%**
Total	**2,656**		**910**		

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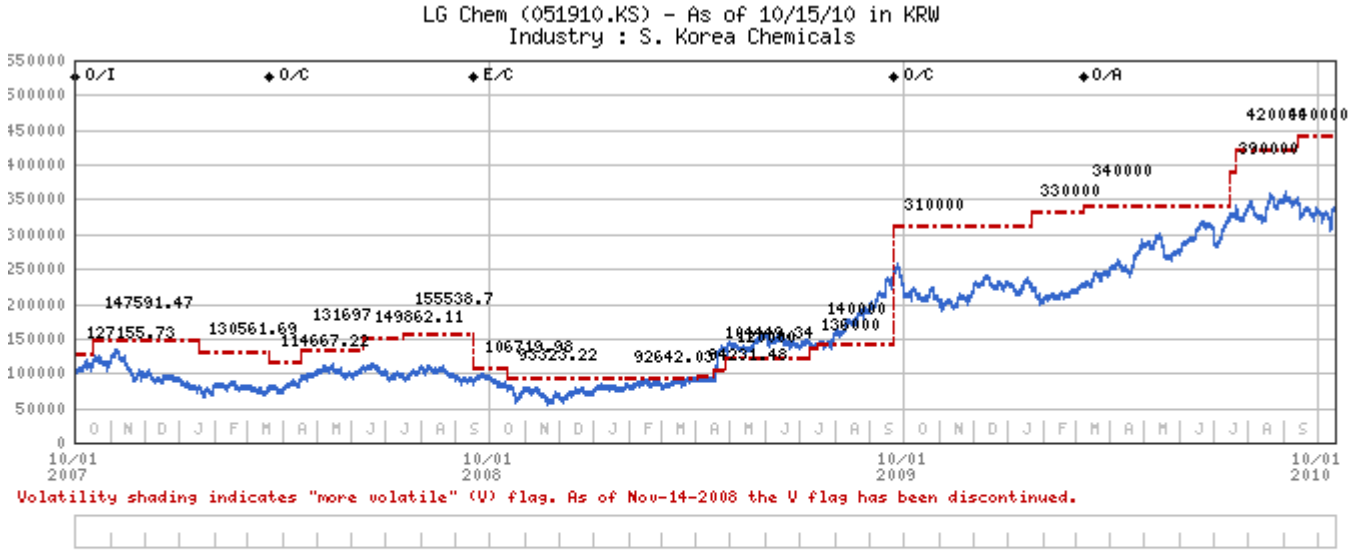
Stock Price, Price Target and Rating History (See Rating Definitions)



Stock Rating History: 10/1/07 : O/I; 3/20/08 : O/C; 9/16/08 : E/C; 9/22/09 : O/C; 3/8/10 : O/A

Price Target History: 7/19/07 : 127155.73; 10/17/07 : 147591.47; 1/18/08 : 130561.69; 3/20/08 : 114667.22; 4/18/08 : 131697; 6/11/08 : 149862.11; 7/17/08 : 155538.7; 9/16/08 : 106719.98; 10/16/08 : 93323.22; 1/28/09 : 92642.03; 4/2/09 : 94231.48; 4/16/09 : 104449.34; 4/27/09 : 120000; 7/10/09 : 136000; 7/16/09 : 140000; 9/22/09 : 310000; 1/21/10 : 330000; 3/8/10 : 340000; 7/15/10 : 390000; 7/21/10 : 420000; 9/14/10 : 440000

Source: Morgan Stanley Research Date Format : MM/DD/YY Price Target No Price Target Assigned (NA)
Stock Price (Not Covered by Current Analyst) Stock Price (Covered by Current Analyst)
Stock and Industry Ratings (abbreviations below) appear as ◆ Stock Rating/Industry View
Stock Ratings: Overweight (O) Equal-weight (E) Underweight (U) Not-Rated (NR) More Volatile (V) No Rating Available (NA)
Industry View: Attractive (A) In-line (I) Cautious (C) No Rating (NR)

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Ticker	Company Name	Close Price (as of 10/14/2010)
ABAN.BO	Aban Offshore Ltd	Rs849.75
AIRP.PA	Air Liquide	€94
APD.N	Air Products and Chemicals Inc.	$82.1
AKZO.AS	Akzo Nobel	€43.845
ALB.N	Albemarle Corp.	$48.52
AKE.PA	Arkema S.A.	€42.3
BASFn.DE	BASF	€50.14
BAYGn.DE	Bayer AG	€55.62
001300.KS	Cheil Industries Inc	W95800
2105.TW	Cheng Shin Rubber	NT$73.8
3983.HK	China BlueChemical Ltd	HK$6.28
CLN.VX	Clariant	SFr16.05
CRDA.L	Croda	1480p
047050.KS	Daewoo International	W36300
DSMN.AS	DSM	€38.945
DD.N	E.I. DuPont de Nemours & Co.	$46.49
ESRO.BO	Essar Oil	Rs139.5
ESSO.BK	Esso (Thailand) Plc.	Bt7
2903.TW	Far Eastern Department Store	NT$40.6
1402.TW	Far Eastern New Century	NT$46.3
1326.TW	Formosa Chemicals & Fibre Corporation	NT$81.2
6505.TW	Formosa Petrochemical Corp.	NT$81.9
1301.TW	Formosa Plastics Corporation	NT$82
9921.TW	Giant	NT$120
078930.KS	GS Holdings	W58400
009830.KS	Hanwha Chemical	W27800
HPCL.BO	Hindustan Petroleum	Rs489.65
011170.KS	Honam Petrochemical	W238500
JMAT.L	Johnson Matthey	1892p
SDFG.DE	K+S AG	€46.185
KRA1V.HE	Kemira	€10.72
036460.KS	Kogas	W49500
KRA.N	Kraton Performance Polymers Inc.	$30.75

Ticker	Company Name	Close Price (as of 10/14/2010)
LXSG.DE	LANXESS	€46.655
051910.KS	LG Chem	W335000
LING.DE	Linde	€100.2
LYB.N	LyondellBasell Industries N.V,	$27.07
1303.TW	Nan Ya Plastics	NT$67.4
OCICq.L	Orascom Construction Industries	$46.05
PPG.N	PPG Industries, Inc	$76.33
PX.N	Praxair Inc.	$90.71
PTTAR.BK	PTT Aromatics and Refining Plc.	Bt30.75
PTTC.BK	PTT Chemical Public Company	Bt137.5
PTTE.BK	PTT Exploration & Production	Bt174
PTT.BK	PTT Public Company	Bt313
RELI.BO	Reliance Industries	Rs1040.9
RHA.PA	Rhodia	€19.21
2010.SE	SABIC	SAR89.75
0297.HK	Sinofert Holdings	HK$4.67
096770.KS	SK Energy	W154000
010950.KS	S-Oil	W71500
SOLB.BR	Solvay	€80.84
SYNN.VX	Syngenta	SFr274
1101.TW	Taiwan Cement	NT$33.75
1722.TW	Taiwan Fertilizer Co Ltd	NT$105
1802.TW	Taiwan Glass Corp.	NT$36.6
1504.TW	Teco	NT$18.35
TOP.BK	Thai Oil Public Company	Bt56.75
DOW.N	The Dow Chemical Company	$29.31
SHW.N	The Sherwin-Williams Co.	$73.11
VAL.N	The Valspar Corp.	$31.98
VCTX.L	Victrex	1318p
WCHG.DE	Wacker Chemie	€148.45
YAR.OL	Yara ASA	NKr281
YULC.L	Yule Catto	244.2p

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