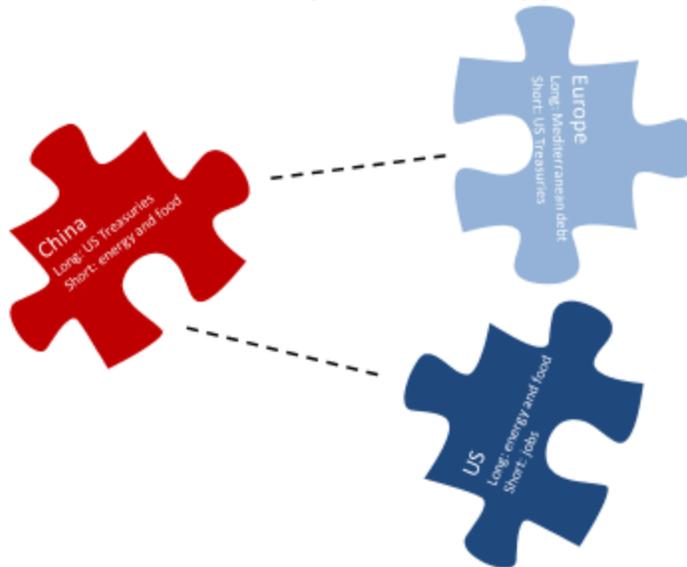


# Commodity Markets Outlook and Strategy

*Will US natural gas help save the world?*

**Exhibit 1: Jigsaw puzzles are solved only when all pieces are used & in the right configuration**  
Until now, Chinese-held US Treasuries and NAM gas and food have been largely absent from debt discussions



Source: J.P. Morgan Commodities Research. Note: NAM = North American.

- Policymakers try to solve a jigsaw puzzle, sitting on the China piece:** In oil, natural gas, corn, and other commodity markets, global production and trade patterns are undergoing historic structural changes that will likely not reverse. The world is primed for a commodity-hued sovereign rebalancing akin to the 1985 Plaza Accord. The essential solution to achieve “escape velocity” from the debt crisis is to get capital into Europe and manufacturing jobs into the US by exchanging Chinese-held US Treasuries for long-run contracts in fuel and food from North America and for realistically-priced European distressed debt.
- Natural gas catalysts are mounting:** Elements of this solution are already breaking out in energy markets in the absence of a formal treaty. Since Sep 1, US politicians have proposed an oil-and-gas drilling boom to create jobs, Canada granted its first LNG export permit, Sinopec acquired a Canadian E&P company, and BG/Cheniere’s landmark LNG deal punctured oil-linked pricing. Beijing says it is willing to post \$100Bn or more to support Europe, its largest trading partner.
- Last week we dropped the defensive posture we adopted on Aug 8, doubled down on our Bull Commodity Basket, and introduced long gas vol strategies:** Until now, gas equities have seemed to offer better risk-adjusted value than the long-dated NYM natural gas curve. Risk is changing. We think there is significant value in now owning \$3.50 puts on Spring 2012 and ATM straddles on Calendar 2015 (k=\$5.00).

See page 23 for analyst certification and important disclosures.

**Commodities**

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## Welcome to the 21<sup>st</sup> Century

- This week, the total public debt outstanding of the US is crossing \$15Tn for the first time. This debt is 5.8X larger than Italy's, 32.5X larger than Greece's.
- The Greek referendum fiasco scared away Chinese capital (for now) but served a fresh reminder to the US Deficit Supercommittee: failure has a high cost.
- The Supercommittee must announce its plan within 8 days. The US Thanksgiving holiday is next Thursday, followed by December festivities. A bold plan could tap into powerful and positive seasonal sentiment.
- The gold price appears to expect the Supercommittee to announce about \$2Tn in deficit reduction. A number closer to \$4Tn would likely crush gold but spur a major rally in global markets. Failure to get the job done likely sends gold to \$2500 per oz and above in 2012, but crushes confidence in the USD.
- Prompt gold is approaching \$1800 per oz. Since Oct 20, the average intraday price change between low and high has been +\$32 per oz. At this vol, the Sep 6 all-time nominal high (\$1920) could be touched within 4.5 trading days. We expect breach of \$2000 in 2011.
- Chinese natural gas demand is growing at an 18% CAGR, against a domestic production CAGR of 13%. The deficit is now -15%, heading to -35% by 2015.
- We outline a scheme for estimating risk in China's natural gas import portfolio. Today's score is equal to "Turkey"—an EU aspirant. Growing North American gas imports to 3Bcfd in 2015 from zero in 2011 would cause risk to slip to "Kazakhstan". In the absence of US/Canadian imports, risk slips to a score of "Syria".
- The price of Dec-11 NYM natural gas (NGZ1) has declined by nearly 30% since late July 2011. It is now priced about \$95/boe below prompt Shanghai fuel oil. Last week we advised exiting shorts and buying vol.

Human civilization is grappling with an important transition: the birth of the 21st Century. But we are 20th-Century people whose natural instincts expect the new century should look like the old. It will not. This is part of our problem.

The human population now numbers seven billion and is on track to reach nine billion by 2050, according to UN demographers.

The incremental two billion is a headcount twice as large as the entire population of the world in the year 1800, at the dawn of the Industrial Revolution. Contrary to Malthusian prophecies, this growth can be accommodated by commodity markets. The incremental population will include a dazzling array of scientists, engineers, artists, and other persons of extraordinary and unique talent, who will create significant productivity in human economic systems. But the enormous scope of the growth needs to be acknowledged if it is to be managed optimally. In thinking about the world's interlocking debt, food, fuel, and security challenges, it is vital to recognize the centrality of China. It is also important to specify the current strengths and weaknesses in the world's largest economic blocs: doing so reveals the shape of the pieces in the jigsaw puzzle and how they may fit together harmoniously.

Europe is (a) long Mediterranean debt that might find stronger bids at lower prices, and (b) short capital and a coordinated fiscal policy. The United States is (a) long dollars, natural gas, and food, and (b) short of tens of millions of jobs. China is (a) long US Treasuries (\$1.2Tn, or 38% of its F/X reserves), and (b) structurally short of many primary commodities.

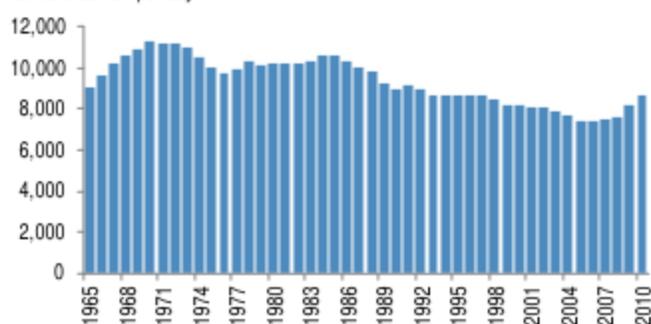
Natural gas is one of the markets that can bring these pieces together for mutual benefit. As a result, historic events are unfolding in natural gas markets that will likely alter the composition of global GDP over many decades. The US and Canada—the world's first and third largest producers—have moved significantly in 2011 toward building gas export supply chains (and gas-related plastics, fertilizer, and chemical chains) that will deliver gas into Asia at prices based on North American gas, not world oil. This is a titanic change from prior pricing schemes and represents an important evolution for world trade and future inflation expectations among consumers, given the nearly US\$100 per boe price differential between Asian oils and North American gas basis.

Until now, a lack of political will and physical infrastructure prevented this price gap from being arbitrated, to the economic disadvantage of all parties. This is now changing, aided by the fact that North American policymakers with green credentials also see an environmentally-sound pathway for capturing this economic return.

The United States is now the world's largest natural gas producer, having surpassed Russia in 2009. The US is also the world's third largest crude oil producer. Casual observers would likely be surprised to learn that the US could become the largest oil producer in the world in just a few years, if it so chose to make the necessary investment in undeveloped resources in order to surpass Saudi Arabia and Russia (Exhibits 2 and 3). Including NGLs and condensates, US petroleum output is 1.42mbd behind Saudi Arabia and 1.69mbd behind Russia.

**Exhibit 2: US petroleum production has reversed trend**

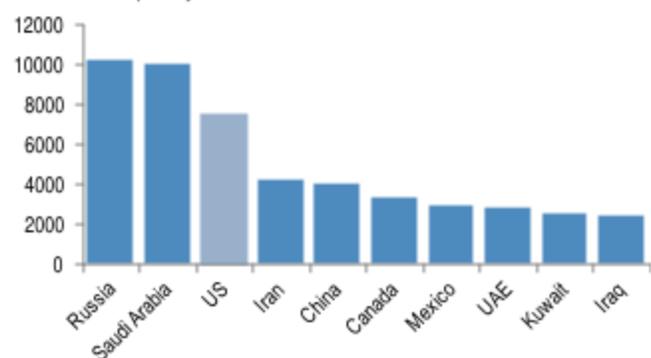
Thousand barrels per day



Source: BPSR, EIA, J.P. Morgan Commodities Research

**Exhibit 3: Top 10 oil producers**

Thousand barrels per day



Source: BPSR, J.P. Morgan Commodities Research

Already, US output has grown by 1.25mbd since 2006—a feat clearly driven by price, and reversal in trend not flagged by the strong form of the “peak oil” argument. In North Dakota alone, crude production has increased to over 400k bpd from about 80k bpd in 2003. The debate in industry is now whether this trajectory slows down above 500k bpd or makes it all the way to 1mbd. We incline toward the larger number. It is worth remembering that the modern global oil industry was born in Pennsylvania in 1859 and for most of the past 150 years the US has been the world's dominant producer.

This is not to suggest that if the US made these investments, it would achieve energy independence. Even if US petroleum output reached 11mbd (a stretch), the US would still remain the largest crude importer in the world, requiring at least 4mbd more than China (the second largest importer). The key concept is that the US would become a larger exporter of energy while also reducing its imports of energy, to the benefit of its balance of payments. Precursors of this trend are evident in the August 2011 export data for US petroleum products, which surpassed 3mbd, or an amount equivalent to about 15% of US oil consumption.

The untapped oil and gas assets held in trust by the Federal government of the United States are an enormous source of underutilized wealth. Recently, political leaders and captains of industry have become more vocal in pointing to these “off balance sheet” assets as a partial counterweight to the “off balance sheet” liabilities of the United States. In August, we presented research that showed the unfunded obligations of the United States now amount to at least \$62Tn on a net present value (NPV) basis. These obligations are in addition to the \$15Tn in national debt, \$16Tn in personal debt, and \$3Tn in state and municipal debt. It is this crushing debt that led to the loss of the US' AAA sovereign credit rating and the creation of the US Deficit Supercommittee. A one-two punch of implementing some of the Simpson-Bowles recommendations on deficit reduction (e.g., raising the retirement age on unborn future generations) and allowing responsible access to these energy assets would likely yield a powerful effect on capital markets.

Actual and potential US oil and gas production growth has already driven a huge gap between world and North American hydrocarbon prices. North American spot gas is now priced just below \$22 per barrel oil equivalent (boe). This is about US\$95 per boe cheaper than Asian spot crudes, even after accounting for the different energy content in gas and oil products. Put another way, spot natural gas at Henry Hub is going for \$3.45 per MMBtu, while crudes in Southeast Asia are priced above \$20 per MMBtu. Propane at Mont Belvieu is north of \$15 per MMBtu; low-sulfur gasoil in Singapore is above \$22 per MMBtu. Asian consumers have very strong incentives to grow gas trading arrangements with the Americans and Canadians.

### China wants natural gas

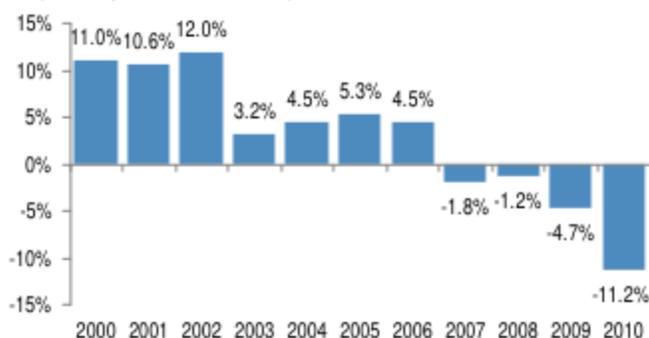
China's production of natural gas has been growing at a blistering 13.5% compound annual growth rate (CAGR) since 2000. However, even this fast rate of supply growth has been insufficient to keep up with China's gas demand, which is growing at a 16.1% CAGR, according to data from

the BP Statistical Review. At the current rate of demand growth, China's annual natural gas consumption would grow in relative size from one-sixth as big as the US' last year to about 40% the size of US demand *within the next five years*.

From 2000 through 2006, the Chinese natural gas market was in structural surplus. Domestically produced natural gas exceeded domestic needs by 3% to 12% (1.1 to 3.5 billion cubic meters) per year. However, the faster rate of growth in domestic demand pushed China's annual gas balance into a sustained deficit starting in 2007 (Exhibits 4 and 5).

**Exhibit 4: China's domestic natural gas balance**

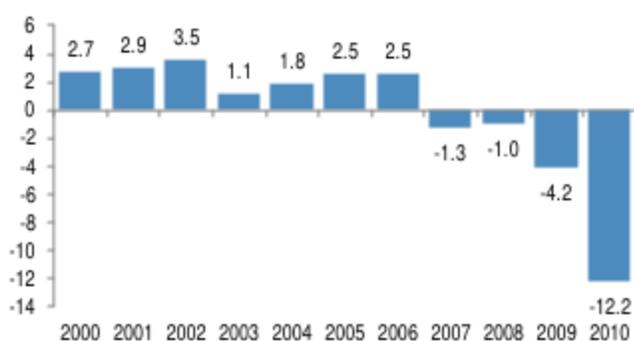
As a percentage of domestic consumption



Source: BPSR, J.P. Morgan Commodities Research

**Exhibit 5: China's domestic natural gas balance**

Billion cubic meters



Source: BPSR, J.P. Morgan Commodities Research

That year, domestic consumption exceeded domestic production by 1.8%. Since then, the deficit has deepened sharply: last year, it reached 12.2bcm, or a gap of about 11.2%. Now, it is closer to 16%. Next year we project it will reach 20%. It is on track to reach 35% by 2015, even after allowing in our model for the start of Chinese shale gas production in 2012. In volume terms, the projected deficit increases from -1.97Bcfd today to -8.75Bcfd in 2015. The latter volume is equivalent to 6X the off-take announced in

the Cheniere/BG long-term LNG export deal through Sabine Pass, which is the first deal of its kind, given its pricing structure.<sup>1</sup>

A rapidly-growing supply shortfall would be a significant challenge for consumers in any commodity market. It is an especially pressing problem in a market as strategically important as natural gas—an essential feedstock for industry and agriculture and a growing resource for lighting and heating the homes of the rising middle class. As a result, natural gas figures prominently in China's 12<sup>th</sup> Five Year Plan. It would be imprudent to underestimate how important this natural gas deficit is to China's security. The gap follows similar strategic shortfalls in iron ore, copper, and oil, which have been met with significant increases in net imports and a meaningful impact on global pricing. In most cases, these price moves were at first poorly understood in the OECD countries and were thus resisted on inaccurate claims of being "non-fundamental". As in other energy markets in China, maximizing security of supply at a reasonable price is a greater priority for Beijing than trying to minimize prices paid at the expense of greater risk.

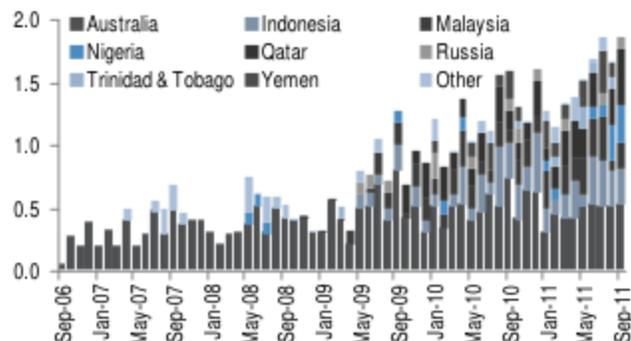
To address its gas shortfall, like Japan and Korea, China has turned to imports of liquefied natural gas (LNG). This is a logical first choice for a country blessed with a bulging capital account but just beginning to build out its gas production, storage, and distribution infrastructure. From virtually no import volume in September 2006, the LNG import trade in China has increased to an average of 1.52 billion cubic feet per day (Bcfd) in 2011 (Exhibit 6). This volume is equivalent to about 2.5% of US production and was grown within the space of five years.

At first, China did what any household suddenly short of a cup of sugar would do—it turned to a neighbor. From 2006 to 2009, Australian supplies dominated China's burgeoning LNG trade flow. However, as the demanded volume has increased to larger requirements, China has moved to diversify its supply base. There are now eight major supplying nations (Exhibit 7). Australia is still the biggest partner in the LNG trade, with a 30% market share. Indonesia, Malaysia, and Qatar follow, each with shares in the 14% to 16% range. Yemen (7.8% of 2011 ytd imports) and Nigeria (7.0%) have picked up market share at Australia's expense this year, but bring other operational challenges, as has been demonstrated in recent weeks by the social unrest in Yemen. Neither the US nor Canada yet export LNG to China.

<sup>1</sup> Cheniere Energy and JP Morgan have a general contractual relationship.

Exhibit 6: China's LNG imports by country of origin

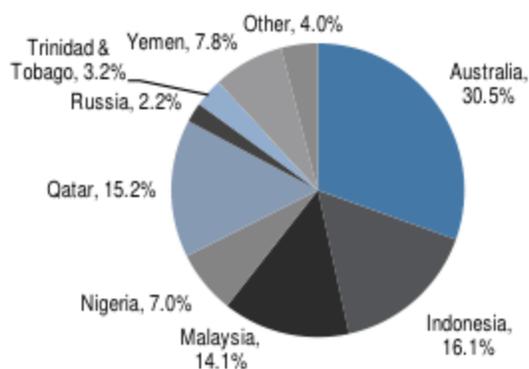
Bcf per day



Source: CGA, J.P. Morgan Commodities Research

Exhibit 7: China's LNG imports by source, year-to-date 2011

Country share of total LNG imports (percent)



Source: CGA, J.P. Morgan Commodities Research

There are currently four LNG terminals operating in China: Dapeng (opened in 2006), Putian (2008), Yangshan (2009), and Rudong (2011). Their collective import capacity is now about 16 million tonnes per year, or just over 2.0 Bcf per day. The largest is Dapeng in Guangdong (0.9 Bcf per day). Another eight projects are in various stages of construction or expansion, which we expect will boost capacity by nearly 3.0 Bcf per day within the next three years. On October 25, PetroChina announced the Dalian terminal is "ready for operation".

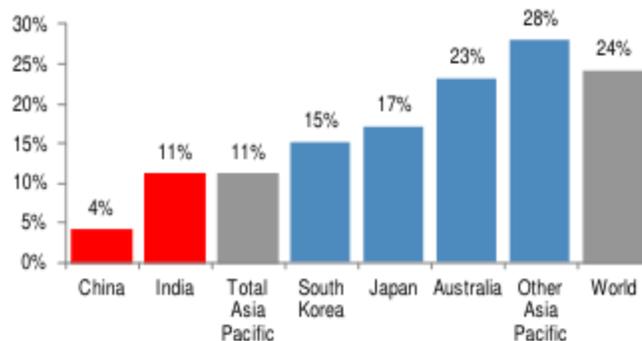
The cost to build all of these facilities, plus the planned-but-not-yet-started terminals, measures in the tens of billions of US dollars. But this cost is a small fraction of the value that China's enormous F/X reserve portfolio (US\$3Tn+) risks losing in relative value and real terms through its US Treasury holdings over the next five-to-ten years. CNY may appreciate by up to 50% against the USD, and the Fed promises to extend zero interest rate policy into 2013,

potentially stoking inflation expectations and outright dollar inflation sooner than central bankers' plans.

Additional regasification capacity is welcome by domestic industry. Existing infrastructure is rapidly running toward full utilization. LNG import data for 2010 from China Customs Administration imply an 86% utilization rate for the Dapeng terminal, a 78% utilization rate for Putian, and a 49% rate for Yangshan. Based on monthly import data through September 2011, we estimate that capacity utilization rates for the Dapeng and Putian terminals have now risen above 90%, while capacity utilization at the Yangshan facility has also increased, to about 58%. Capacity utilization at the Rudong terminal, which opened this year, is already at 16%.

Exhibit 8: Natural gas use as a percentage of total primary energy use

Percent



Source: BPSR, J.P. Morgan Equity Research

Yet, even with the rapid rate of demand growth and associated infrastructure build-out, natural gas today only accounts for 4% of China's total primary energy use (Exhibit 8). This share is paltry by world standards: the global figure stands at 24%. Even India has a gas usage share nearly 3X greater than China's, where coal still makes up 72% of primary energy demand.

This relative bias is unlikely to last for several reasons:

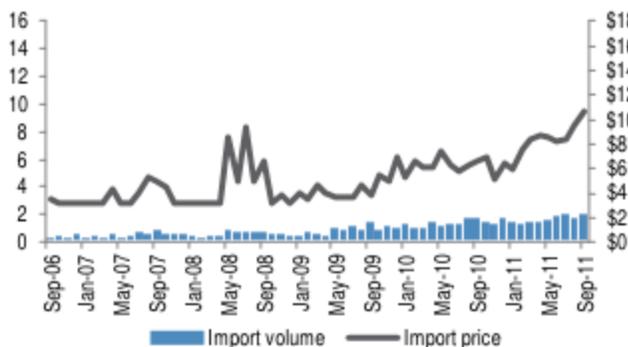
1. domestic opposition to coal mining is growing in response to a number of fatal mine accidents; including two newsmaking incidents in the past two weeks (Henan and Yunnan provinces),
2. a broader trend in Chinese society toward greater social responsibility; in part spurred by public anger over the July 2011 high-speed rail accident in Wenzhou that claimed 39 lives, and

- the general global trend in the G20 countries toward use of cleaner fuels and China's planned adoption of Euro 5 emission standards in Beijing in 2012.

The Beijing leadership is quite clear on its intention to increase gas usage, as clearly spelled out in the Twelfth Five-Year Plan (12FYP). To illustrate China's commitment, we cite several passages from the 12FYP in Appendix B.

Exhibit 9: China's LNG import volume and prices

Volume in Bcf/d (LHS), prices in US\$ per MMBtu (RHS)

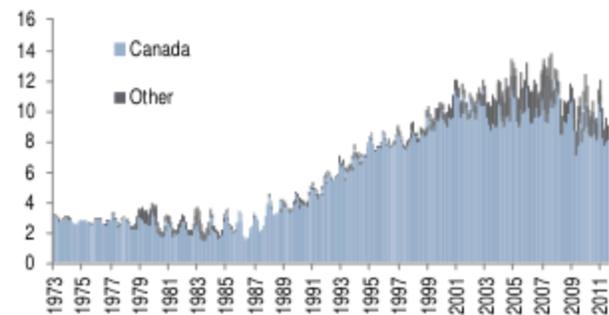


Source: CGA, J.P. Morgan Commodities Research

Already, the data show that China today is willing to pay a higher import price than previously in order to boost its immediately-available natural gas import volumes and thus reduce its vulnerability to its domestic imbalance (Exhibit 9). From 2006 to late 2009, contracted LNG import prices into China tended to be below US\$4 per MMBtu, with some price spikes during the summer of 2008, when global energy prices made their cyclical peak. The most recent observations from this summer and fall reveal trends toward more volume and higher price, passing US\$10 per MMBtu in September, or nearly three times where it averaged in previous commercial arrangements. This pickup reflects higher exposure to oil-price-linked LNG cargoes.

Exhibit 10: US natural gas imports

Bcf per day

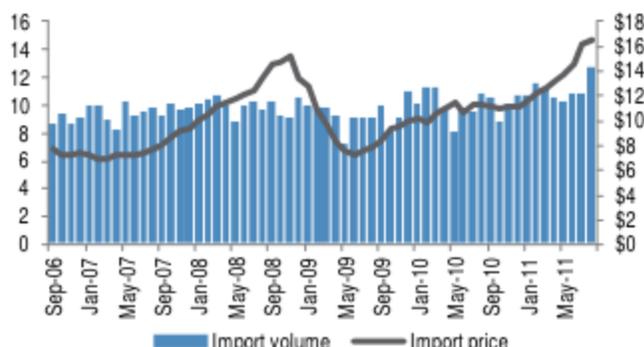


Source: DOE, J.P. Morgan Commodities Research

For reference, through July 2011, Japan's LNG import volumes had not actually surged as much as might have been expected following the Tohoku earthquake, perhaps emphasizing the initial sluggishness in the recovery in industrial production. However, that pattern changed suddenly in August, as imports surged from about 10.0Bcf/d to 12.6Bcf/d at an average price above \$16 per MMBtu, also reflecting oil-linked pricing mechanisms (Exhibit 11).

Exhibit 11: Japan's LNG import volume and prices

Volume in Bcf/d (LHS), prices in US\$ per MMBtu (RHS)

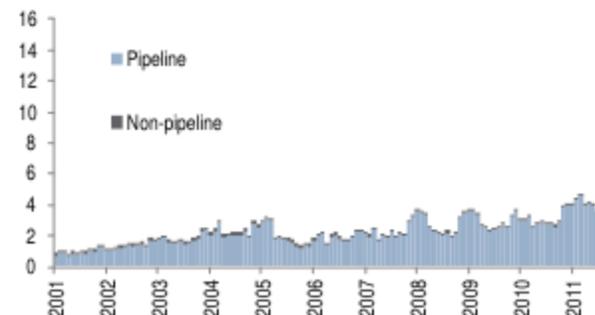


Source: LNG Japan Corporation, J.P. Morgan Commodities Research

This development is so important, it bears repeating. The recent surge in LNG prices paid by China reveals: (1) a willingness to pay an oil-linked gas price for access to immediate supply, and (2) a strong incentive to *move away* from oil-linked pricing toward a delivered price tied to a cheaper North American gas price. Both the Chinese and Japanese LNG import price curves exhibit acceleration in upward price momentum since mid-summer. **Japan and China are now competing with each other, through price, for LNG molecules.**

Exhibit 12: US natural gas exports

Bcf per day



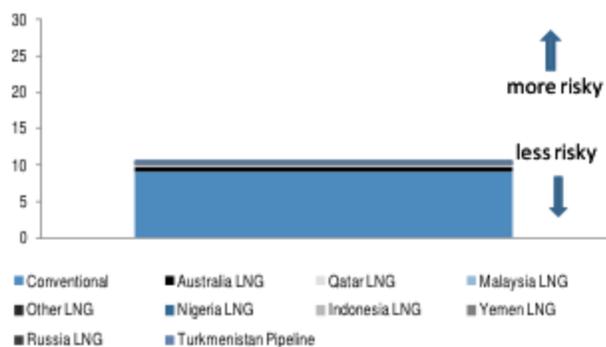
Source: DOE, J.P. Morgan Commodities Research

Meanwhile, US Department of Energy (DOE) data continue to show a secular trend toward lower gas shipments from Canada into the US and quietly-but-steadily increasing exports from the US to its neighbors, especially Marcellus molecules into Canada (Exhibits 10 and 12). Our sense is US industry, especially in Texas and Oklahoma, thinks of Canadian trade in net terms and is not fully focused on the fact that US gas pipeline exports already reached 4.5Bcfd in March of this year, averaging 4.0Bcfd year-to-date through August. Total US gas exports, which include flows of LNG from Alaska to Japan, reached 4.7Bcfd in March and have averaged 4.1Bcfd year-to-date.

The global structural changes underway in gas markets have not escaped the attention of the Chinese as they contemplate their strategic options and risks over the next five years.

To frame the risks, we decompose China's physical natural gas portfolio by domestic and foreign sources. The total size of the portfolio is the volume of supply flowing to meet Chinese gas demand in a calendar year: in 2010, this was 10.5Bcfd (Exhibit 13). To compute an empirically-derived and reasonably objective geopolitical security risk score for this physical portfolio, we take the Heritage Foundation Economic Freedom (HFEF) indices by country and calculate a portfolio score equal to the weighted average of the individual import flows multiplied by their freedom scores.

**Exhibit 13: China's natural gas portfolio by supplier (2010)**  
Bcf per day (Risk score of portfolio = 90.0. See text for explanation.)



Source: Company Reports, BPSR, CGA, Heritage Foundation, JPM Commodities Research

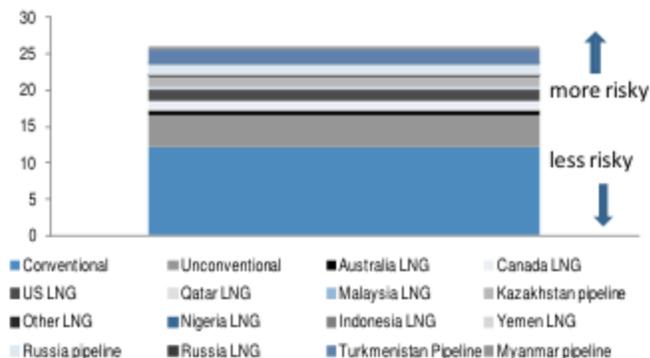
We make one adjustment in incorporating China's domestic production into our analysis. Heritage gives China a score of 52.0 in its methodology (ranking in between Cameroon and Mauritania for this measure of riskiness). For our purposes, we assign a value of 95.0 for China's conventional gas production and a score of 90.0 for China's as-of-yet-nonexistent unconventional gas production, as Beijing will view these "baseload" supplies as very reliable from a

geopolitical standpoint. We avoid using 100.0 in order to acknowledge the small but real potential for terrorism, natural disasters, and other intentional and unintentional operational hiccups.

Following this method, we compute a portfolio risk score of 90.0 for 2010, as domestic conventional production's ability to cover 90% of demand significantly outweighed the risk associated with, for example, Yemen's at-the-time 10% share of the 10% sliver of demand supplied by imports.

This methodology also allows us to compute a geopolitical risk score for China's projected gas portfolio in 2015, using our estimates of flows from both new conventional and unconventional sources (shale), as well as new suppliers, including Canada and the United States (Exhibit 14). Estimates from the US Department of Energy show that China's shale gas resource is 1275Tcf, which makes it larger than that of the US (750Tcf). (Unconventional production is a grey tranche in Exhibit 14). Our volume estimates will inevitably show slippage against realized developments. More important is the value in having a tool to quantify the portfolio risk that China faces and accepts as it manages the rapid rate of demand growth.

**Exhibit 14: China's natural gas portfolio by supplier (2015F)**  
Bcf per day (Risk score of portfolio = 82.0. See text for explanation.)



Source: Company Reports, BPSR, CGA, Heritage Foundation, JPM Commodities Research

As China's consumption reaches 25Bcfd in 2015, we expect significant growth in domestic production, as well as substantial pipeline imports from Turkmenistan, Myanmar, and Russia. If China gets just 3Bcfd in combined imports from the US and Canada in 2015 (among the other supply developments), the portfolio's projected riskiness score drops only to 82 from 90 in 2010, comparable to the HFEF score for Australia—a desirable result from a security of

supply standpoint. If North American supplies are not available and China instead fills that 3Bcfd sliver of demand with supplies from Russia and the Middle East, the portfolio's risk score likely drops closer to 77, which is riskier but still equivalent to the HFEF scores for Bahrain or Chile, both of whom enjoy reputations as reliable partners in commodity export markets.

These portfolio scores include China's domestic production. If we isolate just the import component and score that subportfolio through time, the picture is not as comforting. Today's import portfolio scores 64, or about the equivalent of the HFEF score for Turkey—still in the realm of an EU aspirant but significantly riskier than the baseload supply. Even with the 3Bcfd we project will come from North America, by 2015 the score drops to 62, on par with Kazakhstan. If the 3Bcfd have to come from Russia or the Middle East, the score drops to 51, on par with Syria, which ranks #140 out of the 179 countries on the HFEF list. That gap from 62 to 51 looks to us like a tipping point in risk, leading us to conclude that China will continue to pursue deals in North America, typically as a minority, silent partner out of respect for political sensitivities, especially in the United States.

The Beijing leadership has this summer witnessed street protests in London, Rome, and various cities in the US, providing hints of the cost of getting this forward gas risk wrong. Beijing wishes to avoid comparable social unrest in Chinese cities where millions of rural citizens resettle each year. Beijing has a strong incentive to help finance North American commodity production and export infrastructure in exchange for long-term supply security, even under floating price agreements. There is a real option value to reducing China's physical gas portfolio risk, with benefits not only for China but also for the peace of the world. North American industry should keep this in mind when trying to interpret the bids of Chinese energy companies vying for North American energy assets.

We estimate that China's natural gas imports (pipeline plus LNG) to meet domestic demand will increase by a factor of six from 2010 to 2015. This represents an incremental 7.9Bcfd, before any linepack fill or baseload stocking. As China's need for imported gas grows, the nation will likely attempt to minimize both import security risk as well as the risk associated with the overall gas supply portfolio.

In a prior era, sovereign-level treaties would have taken the lead role in inaugurating these new international pathways for investment and trade. Given the seriousness of the global debt crisis, a special treaty might yet occur in order to affirm

policymakers' commitment to a robust, commodity-intensive solution to put together the jigsaw puzzle we describe. In September 1985, at a similar moment of imbalance in world currency markets, the governments of five G-7 nations signed the Plaza Accord in order to depreciate the USD.

But with the World Trade Organization (WTO) and other international bodies already facilitating cross-border commercial flows, the Canadian and American governments have been more focused on reviewing and approving leases and gas export permits rather than searching for a "Grand Bargain" that links natural gas to broader imbalances in the world economy. Consequently, the recent sequence of historic and market-changing catalysts in the US natural gas market—many of which we have been anticipating would unfold in 2011—has largely been announced by the private sector (see Appendix A for a timeline).

This is not to say that the Canadian and US governments have been disengaged. One historic breakthrough was Canada's granting of an export permit to the Kitimat terminal on October 13, which echoed a similar license granted by the Federal government of the US to Sabine Pass in May (see timeline). The Kitimat permit is the first export license granted by Canada's National Energy Board since deregulation of the gas industry in 1985, according to the Board's website.

Less than two weeks later, Cheniere and BG announced a 20-year LNG export deal through a to-be-built liquefaction facility at the existing Sabine Pass terminal in Louisiana. The new train will be the first modern liquefaction plant built in the US. The contracted volume is 3.5mmt per year (20% of projected capacity) in a take-or-pay arrangement. Cheniere expects to be exporting by 2015. BG will pay 115 percent of the Henry Hub price plus \$2.15 per MMBtu plus transportation cost.

Cheniere estimates transportation costs from the US Gulf Coast to Asia are now about \$2.80 per MMBtu. Given that China and Japan are already paying \$12 to \$16 per MMBtu for LNG on a delivered basis, if the Sabine Pass option were available today, spot Henry Hub physical gas could be \$6.13 to \$9.61 per MMBtu today and still be competitively priced with oil-linked molecules in North Asia. The midpoint of the imputed range implies \$7.87 per MMBtu. This is more than 2X the current spot price. The imputed range is also generally above the price level that many in industry believe will be the ceiling for the spot price for many years.

But violation of that supposed ceiling is an outcome consistent with the economics of marginal cost and the wide

dispersion in fuel prices waiting to be arbitrated. There is a ready analogue in the rail and truck investments that have been pursued in 2011 to narrow the historically-wide Brent-WTI spread. Rail shipments of petroleum and petroleum products in the US Midcontinent as of October, for example, are up 19.4% YoY, according to the Association of American Railroads, as Bakken barrels are moved toward the NYM delivery hub at Cushing, OK and onward to the Gulf Coast.

Similarly, the potential for North American gas prices to reflect the marginal molecule in Asia consumption, rather than local production costs in a US basis, is reminiscent of the marginal cost economics that became so obvious in oil in 2008. That year, an oilsands producer in Canada or a deepwater producer in the Western Gulf of Mexico or offshore Angola, who might have carried production costs somewhere between \$50 and \$65 per bbl, still received upwards of \$140 per bbl on every barrel for a short period of time because at that instant the marginal molecule of global oil demand (driven by Asia) called upon the marginal molecule of supply (biofuels in Romania and the US) *and every barrel in the world cleared off that marginal price.*

Meanwhile, the recent and sudden increase in demand for LNG has rapidly strained shipping capacity. LNG carrier rates have increased by nearly 300% since early summer. We understand recent charter contracts are over \$120,000 per day, among the highest rates ever. Waterborne LNG data show that through 2017, an additional 58.2mtpa (7.65Bcfd) of liquefaction capacity will likely be added around the world. As substantial as this volume would be against current needs, this number is smaller than our projection for China's likely growth in import demand through 2015 (two years earlier than Waterborne's window), implying that Central Asian pipelines also are likely to be a vital component of the solution to balance the Chinese gas market. Our analysis suggests China's physical gas portfolio will call on at least half of the new global liquefaction capacity.

China's gas infrastructure is making rapid strides, but it is from a small base and much work remains to be done. At the end of 2010, China National Petroleum Corporation (CNPC) had 32.8 thousand kilometers (km) of natural gas pipelines, 14.8 thousand km of crude oil pipelines, and 9.3 thousand km of refined product pipelines, according to company data. CNPC's estimates of its total pipeline market share in 2010—80.5% in natural gas, 69.2% in crude oil, and 49.1% in refined product pipelines—implies China's total pipeline network at the end of 2010 consisted of about 40.7 thousand km of natural gas pipelines, 21.3 thousand km of

crude oil pipelines, and 18.9 thousand km of refined product pipelines.

For reference, the US, with six times China's demand, had nearly 500 thousand km of natural gas pipelines for interstate and intrastate traffic in 2009, according to the EIA. Thus, the American network is more than ten times bigger than China's current network. As China's gas demand rises toward one-half the size of the US over the next 7 years, it is not unreasonable to expect its gas pipeline network to double to 80 thousand km and likely much more (CNPC projects its network alone will be 64 thousand km), especially when one considers that logical sites for storage (e.g., the depleted oil fields of Dalian and other potential assets in Northeastern China) are nearly 3 thousand km away from the fast-growing cities of the South, such as Chongqing. Clearly, China will also look to build more convenient storage in southern coastal provinces, but this sensible strategy will incur cost.

Independent confirmation of the general soundness of these expectations comes from the US-China Economic and Security Review Commission, which believes China will increase its total oil and gas pipeline length by 150 thousand km in the next five years.

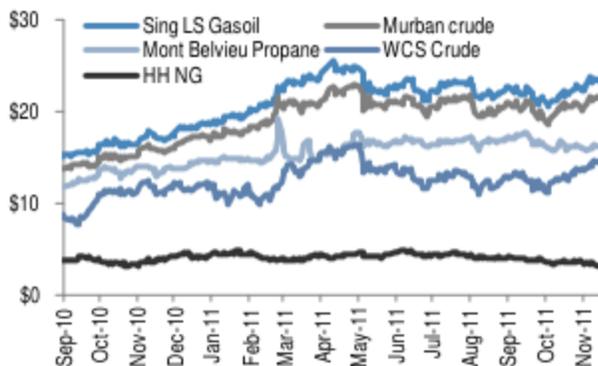
The scope of likely costs for such investments are signaled by CNPC's recently completed second West-East gas pipeline, an 8,704 km project that became operational this year and transports imported gas and domestic reserves from the west. It cost RMB142.2 billion (US\$22 billion) or about US\$2.5 million per kilometer, according to company data. This implies upwards of \$100Bn of gas pipeline investment, or another US\$20Bn per year for at least the next five years. We expect actual expenditure will persist at close to that level beyond the five-year-forward window.

Properly assessed over the time horizon of the next decade and longer, China's real option in accessing molecules from North America is likely to prove extremely valuable, worth far more than might be inferred from the recent behavior of North American producers selling the long-dated curve.

US natural gas is cheap on a btu basis: in spot terms, it is about US\$3.45 per MMBtu. This price is the equivalent of US\$22 per boe, or \$95+ per boe cheaper than distillate-rich crudes in Asia and low-sulfur gasoil in Singapore (Exhibit 15). Moreover, work by our colleagues in Equity Research reveals that global LNG projects between 2000 and 2010 (largely sited in Qatar, Trinidad, Egypt, Australia) experienced significant construction delays and cost overruns (see: Benjamin Wilson et al., LNG Execution Risk, 8 March 2011). Their data show that 34% of projects in that

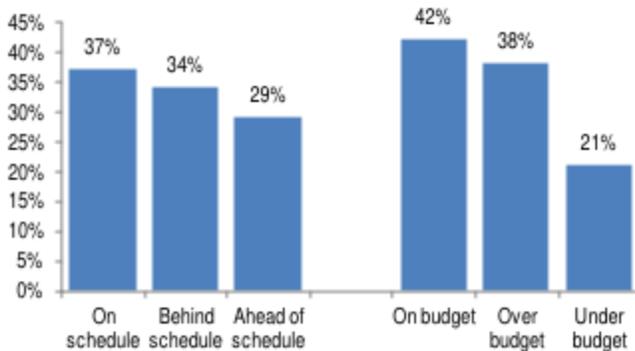
interval fell behind schedule and 38% came in over budget (Exhibit 16). These are not welcome numbers for China, where unexpected time delays equal security risk.

**Exhibit 15: US gas is cheap; China would be a terrific customer**  
US\$ per MMBtu



Source: Bloomberg, J.P. Morgan Commodities Research

**Exhibit 16: LNG construction schedule and cost overruns**  
Global projects between 2000 and 2010, percent



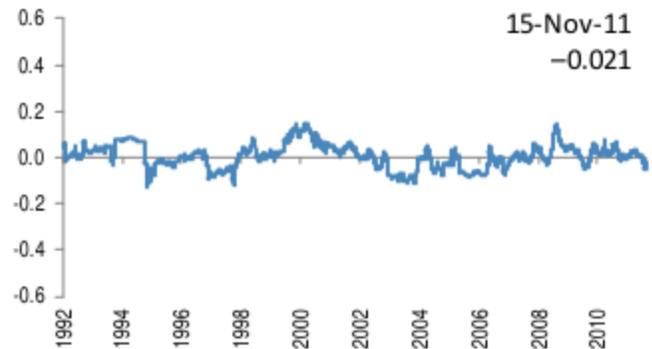
Source: Company Reports, J.P. Morgan Equities Research. Construction (N = 35); cost (N = 24).

Based on three recent field trips to the US Midcontinent, our sense is that gas producers in Texas, Oklahoma, and Louisiana underestimate the coming influence of the Chinese currency on price variation in their product, largely because it is true there is no discernible effect today. This is entirely understandable. With CNY still carefully managed by Beijing and physical natural gas not trading between China and North America, the correlation is zero (Exhibit 17).

However, many operators working exclusively in the Barnett and other US basis markets who do not have international customers also seem to think the Canadian dollar has little bearing on local gas prices. Yet, a simple correlation analysis shows that the Canadian dollar tends to exhibit a positive correlation with the prompt NYM gas futures price, even on low frequency horizons, such as rolling 1-year windows (Exhibit 18). This relationship has tended to wax

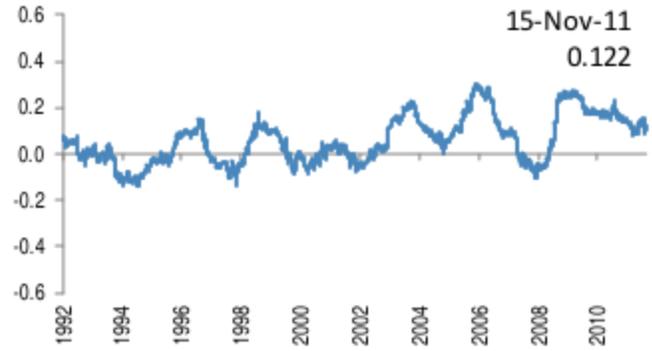
and wane with the quantity of US demand for Canadian imports. In some years, the correlation has been as high as 0.30; today it is about 0.12.

**Exhibit 17: Correlation between CNYUSD and NG1**  
Rolling 255 day moving average



Source: Bloomberg, J.P. Morgan Commodities Research

**Exhibit 18: Correlation between CADUSD and NG1**  
Rolling 255 day moving average



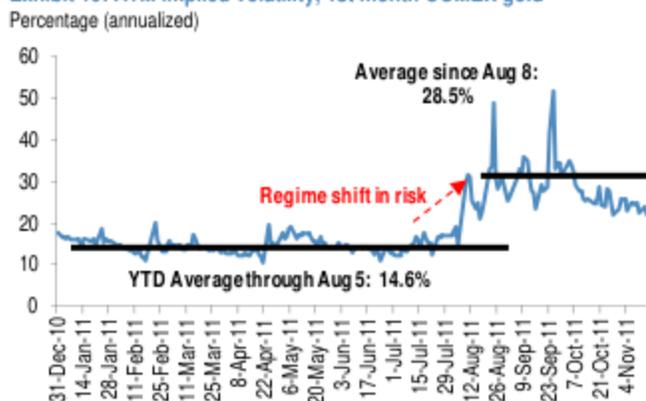
Source: Bloomberg, J.P. Morgan Commodities Research

### Gold confounds bears that make the mistake of seeing only momentum, not vol

Another market-based view into the evolving capital account and current account relationships among China, Europe, and the United States can be found in the gold price. Since late summer, gold options prices have given surprisingly useful signals on the likely probabilities of a European sovereign debt default, Euro or USD crisis (vs. the CNY), and the coming success or failure of the US Deficit Supercommittee.

In mere days in August, following the downgrade of the US sovereign credit rating and the intensification of the European debt crisis, average at-the-money (ATM) implied volatility in the prompt CMX gold contract *doubled* (Exhibit 19).

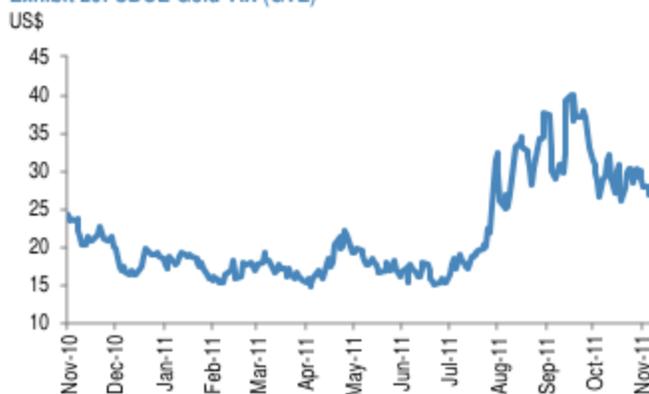
Exhibit 19: ATM implied volatility, 1st month COMEX gold



Source: CMX, J.P. Morgan Commodities Research

At times in August and September, this measure of riskiness further spiked from the new baseline of 30% toward 50% in the prompt contract. Intraday vols were even higher, spiking toward 70%. This regime shift in volatility is the strongest in more than thirty years—since early 1980—when gold made what is still the all-time high in real terms (\$2540 per oz in Oct-11 USD).

Exhibit 20: CBOE Gold VIX (GVZ)



Source: CBOE, J.P. Morgan Commodities Research

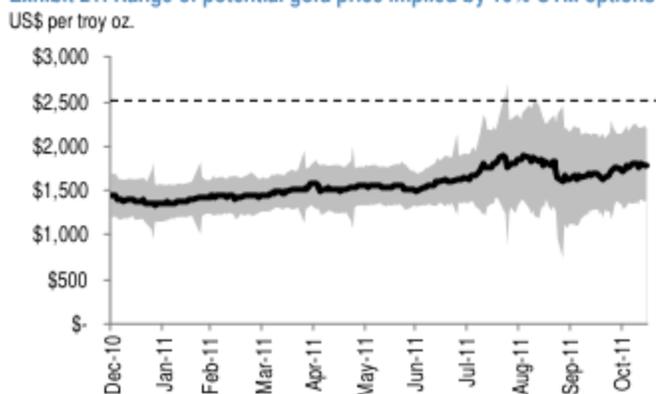
In our view, it is not possible to assess accurately what is happening in gold without first: (a) recognizing that this huge move in implied volatility has happened, and (b) understanding what the move in implied volatility means for perceived riskiness and the range of potential prices.

But judging by market chatter, even now, the volatility regime shift does not appear to have been widely recognized, despite the availability of prices for exchange-traded instruments that enable real-time tracking of it, such as the Gold VIX ETF (Exhibit 20). These volatility charts ably help illustrate an important point. It is a mistake to think of sharply rising prices only as “bullish” and sharply falling

prices as “bearish”: by definition, high implied volatility requires strong up *and* down movements for validation.

Because of the movements in vol space, gold prices have proven to be a useful analytic tool even for market observers who do not invest in precious metals. It has been a bizarre coincidence that the Deficit Supercommittee (a derivative of Congress) happens to have been given by statute a lifespan whose expiry (Dec 23) happens to align neatly with the expiry of the Dec-11 CMX gold contract (Dec 28). In August, this strange congruence suddenly enabled way out-of-the-money (OTM) premia to serve as a kind of barometer on news flow related to deficit reduction and European sovereign bailouts, as far OTM strikes on near-dated contracts had little else to price other than the probability of a policy error. In our work, we have focused on the \$2500 strike, because this is the price level that would mark a new all-time high in real terms and because it is close to the industry’s marginal cost (inclusive of capital costs), set by projects such as the proposed expansion of Olympic Dam—a large uranium and metals deposit in Australia, which is winding its way through a political review process.

Exhibit 21: Range of potential gold price implied by 10% OTM options



Source: CMX, J.P. Morgan Commodities Research

There is also an underappreciated fundamental story in gold. Physical demand from India and China has doubled to 1.83 million kg per year since 2008 (Exhibit 22). Production in South Africa, long the dominant producer, has halved to about 0.19 million kg per year since 2003 (Exhibit 23). In between, Central Banks have emerged as some of the most forceful buyers of physical bullion: Russia’s gold reserves have increased by 14.5 million ozs since 2006, rising to 27.3 million oz from 12.8 million oz (Exhibit 24).

Gold is not a safe haven in a high-vol environment. Gold is a risk asset with surprisingly strong potential upside for the balance of 2011. For example, significant uncertainty

lingers about next steps for Europe. If Greek sovereign debt (€340Bn, US\$462Bn) is the domino that leads to Italian sovereign debt (€1899Bn, US\$2,582Bn), is the next piece to drop really France (€1,591Bn, US\$2,163Bn)? As the world focuses on Europe, attention seems to have become rather complacent about the debt problem in the United States (US\$15,000Bn, €11,029Bn).

Yet, by its legal mandate the US Deficit Supercommittee must vote a plan out of committee within the next 8 days, or by the day before the US Thanksgiving holiday. **This timing presents the intriguing possibility that the Supercommittee has deliberately and successfully driven expectations so low that global markets are positioned for a positive surprise.**

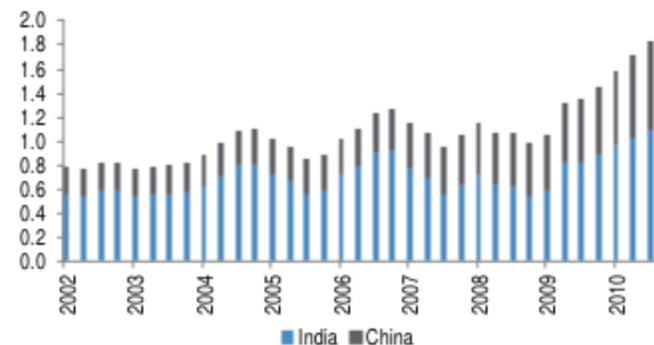
If so, this could be a particularly successful strategy, with beneficial effects for the entire global economy, as the Thanksgiving holiday will immediately lead on to a succession of December holidays, giving markets strong tailwinds on consumer and business sentiment. Conversely, if the Supercommittee is as deadlocked as it appears on the surface to be and frustrates already weak expectations, then public sentiment could swiftly deteriorate, hurting holiday retail sales, in turn sending the OECD economies into a tailspin. It seems important that the Supercommittee not fail.

Given the central path we assign to the muddle-through scenario for the Deficit Supercommittee, we expect spot gold to spurt above \$2000 per oz within the remainder of 2011. At current levels of realized volatility, it would take only 4.5 trading days to reclaim the all-time nominal high price that was achieved intraday on September 6 (\$1920 per oz).

If the Deficit Supercommittee were to fail in achieving its mandate, then gold prices could move sharply higher than \$2500 per oz, as confidence in the USD would likely be impaired. Contrariwise, if the Supercommittee credibly reduce the deficit by \$4Tn or more, gold prices would likely stumble and copper, oil, and global equities would likely surge. Putting all the pieces together, our sense is commodity markets generally are embedding the expectation the Deficit Supercommittee will do \$1.5Tn to \$2.0Tn, or in other words, what they are supposed to do, plus a little extra.

Exhibit 22: Consumer demand for gold in India and China

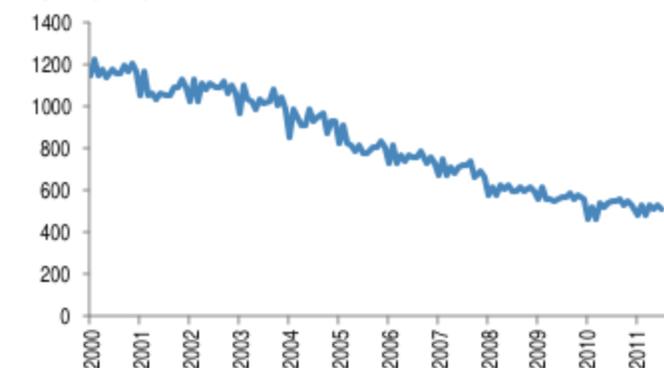
12-month running total in million kg



Source: GFMS, J.P. Morgan Commodities Research

Exhibit 23: South African gold production

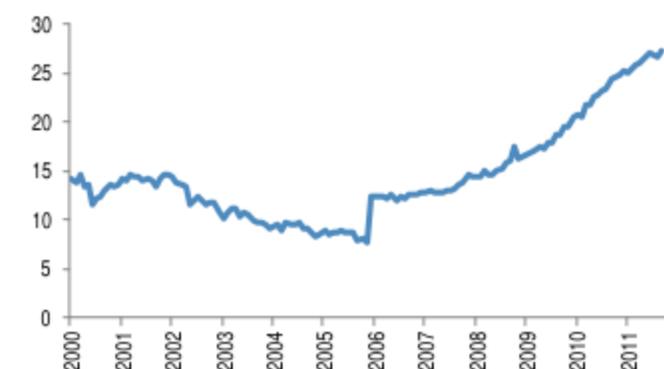
Kilograms per day



Source: WBMS, J.P. Morgan Commodities Research

Exhibit 24: Russia gold reserves

Million ounces



Source: IMF, J.P. Morgan Commodities Research

## A *rerate*, not a *reset*, in the composition of Chinese and US GDP

Proposals for how to fix the world's debt problem and get the world "back on track" start with a central conceptual flaw, because the global economy is not trying to get back on track. It has already jumped the rails into a new century. The pre-crisis world of 2007 is gone forever. There are new tracks for getting fuel, food, and metals from North America and other major commodity producers into Asia.

Global investment and trade patterns, for example, are likely to significantly recalibrate the compositional mix of GDP in the world's two largest economies (US, China). These old friends are likely to deepen commercial ties and start looking more like each other in terms of decomposition of shares of GDP. This is a contrarian view to the bias held by many old-hand policymakers, whose prescription for America's ills is to increase government debt in an attempt to kick start US household consumption. Given the large jobless rate, the debt overhang, and the long-run structural imbalances, the old-hand approach will struggle to succeed, which is partly why President Obama's jobs bill was defeated.

It may be useful to recall that the equation for GDP is simply:

$$\text{GDP} = \text{Consumption} + \text{Government Spending} + \text{Investment} + \text{Trade,} \\ \text{where Trade is Exports less Imports}$$

For decades it has been axiomatic that the US trade balance will be in deficit and the Chinese trade balance will be in surplus. Indeed, the widening of trade gaps between the two nations has contributed to frictions over currency valuations for nearly 20 years. But this is now changing (Exhibit 25). The surplus balance in China, and the deficit balance in the US, may have already reached their peak/trough. We believe Canadian gas imports displaced from the US to China will help drive these two curves toward each other. Corn and other exports from the US to China will also contribute to that result.

Moreover, the reality is that managed rebalancing in the CNYUSD cross has been underway for some time. Beijing has allowed the CNY to appreciate by 7% against the greenback since June 2010, resuming a gradual trend after a two-year hiatus during the recession when the exchange rate was fixed at 6.83. The CNY has appreciated by 20% against the USD since the middle of 2006.

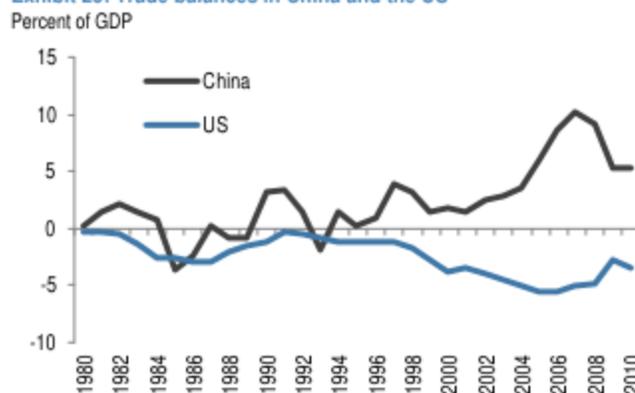
The rising middle class in China will increasingly spend its wealth on goods and services that will require primary

commodities as inputs. These inputs could be obtained from Africa, Latin America, and elsewhere, but they are in surprising abundance in the United States and Canada—countries characterized by operational efficiency, reliable product specifications, rule of law, sanctity of contracts. The North Americans are starting to realize there is strong and sustained business to be done.

From the perspective of the United States, this means *jobs*, potentially millions of manufacturing jobs in particular. According to the American Petroleum Institute (API), in 2009, the oil and gas industry accounted for 2.19 million jobs directly and supported another 6.97 million jobs indirectly, meaning that more than 8% of the full-time employed workforce in the US are tied to the industry.

Industry consultants, working for API, have estimated that development of the Marcellus Shale over the next ten years could create upwards of another two hundred thousand jobs, with potentially a million jobs created nationwide by 2020. To us, these estimates actually sound low relative to potential. Judging by the ongoing shortage of labor in the Bakken play in North Dakota, if the United States were to get serious about developing its oil and natural gas endowment, we would not be surprised to see total job creation (including indirect jobs) be closer to 2-to-3 million. We hear anecdotal reports from the Midcontinent that truck drivers are being offered wages of \$200,000 per year and experienced welders can now command up to \$500,000 per year.

Exhibit 25: Trade balances in China and the US



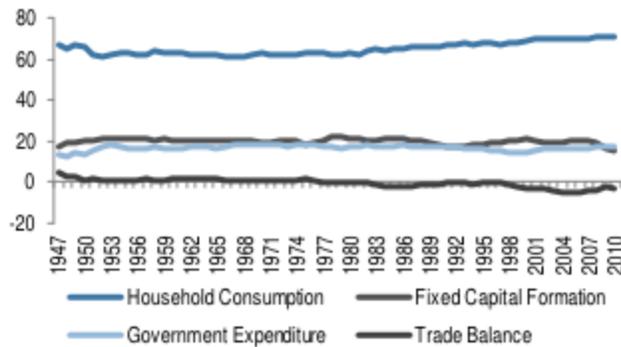
Source: IMF, J.P. Morgan Commodities Research

In the US, the share of household consumption as a percentage of GDP has been climbing since the late 1960s, while the trade balance moved into a sustained deficit in 1976 (Exhibit 26). In contrast, the share of household consumption in Chinese GDP has been generally falling

since the early 1980s (Exhibit 27). Fixed capital formation surpassed it as the largest share in 2003.

Exhibit 26: US GDP components

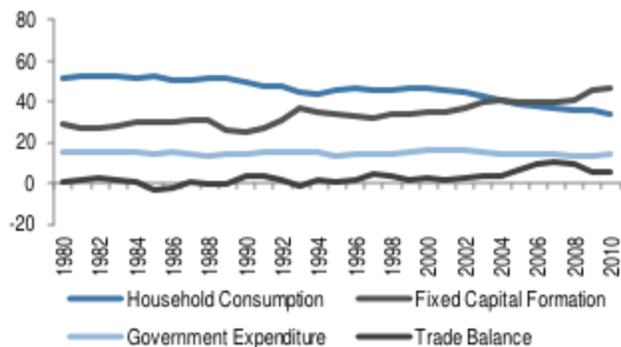
Percent of GDP



Source: IMF, J.P. Morgan Commodities Research

Exhibit 27: China GDP components

Percent of GDP



Source: IMF, J.P. Morgan Commodities Research

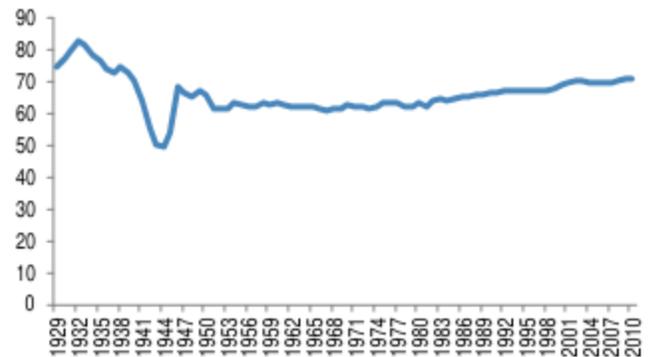
A longer-history chart of US household consumption as a percent of GDP gives a sense of the potential size of the coming changes (Exhibit 28). In the early stages of the Great Depression, the household consumption share surged from 75% to over 80%, as corporate activity slouched. The subsequent economic devastation and world war reoriented the composition of US growth toward government spending in the form of public works programs and then a massive shift toward industrial production, in support of the war effort. By 1944, the household consumption share of GDP in the US had bottomed at 49%, as Rosie's rivets supplanted the raccoon coats of 1928.

We are not expecting either global depression or world war. At the same time, given the evident geopolitical risks alive today, one cannot entirely discount the possibility of regional conflict in South Asia or the Middle East—a risk underscored by this year's Arab Spring in the Middle East

and more recently by the IAEA's announcement of nuclear centrifuges in Iran.

Exhibit 28: US household consumption

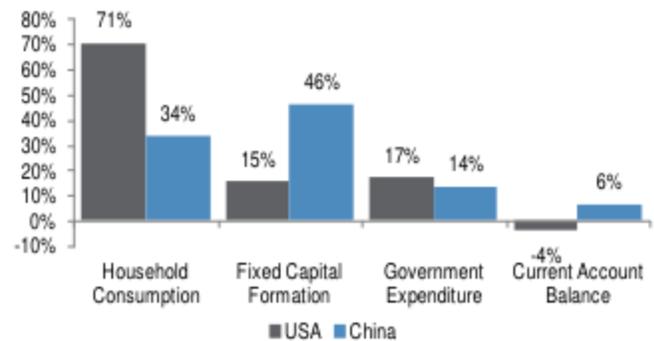
Percent of GDP



Source: IMF, J.P. Morgan Commodities Research

Exhibit 29: Breakdown of GDP components in China and US (2010)

Percent of GDP



Source: IMF, J.P. Morgan Commodities Research

Looking forward over the next decade or more, we would not be surprised to see the trade balances flip toward +5% for US and toward -5% for China, from -4% and +6% respectively in 2010, moves of +9%-points and -11%-points respectively. Given the ongoing gross underinvestment in commodity capacity and the propensity toward cost overages and unexpected delays in large-scale infrastructure projects, we also take seriously the proposition that consumption and investment could see swings of as much as 10%-to-15% points in each country, bringing US consumption from 71% toward 56% to 60% and Chinese consumption from 34% to about 45% to 49%. Fixed capital formation might rise toward 30% from 15% in the US, and fall toward 30% from 46% in China. These are structural swings attendant to long-lived supercycles for investment and consumption, which are impossible to align perfectly in the short run. Guessing of future demand (and which technologies "win" in the future) is unavoidable.

In essence, if these long-cycle structural changes evolve as we describe, the two economies would look far more similar from a compositional perspective than they do today, which could enable far less friction over balance of payments and currency valuation than is the case today.

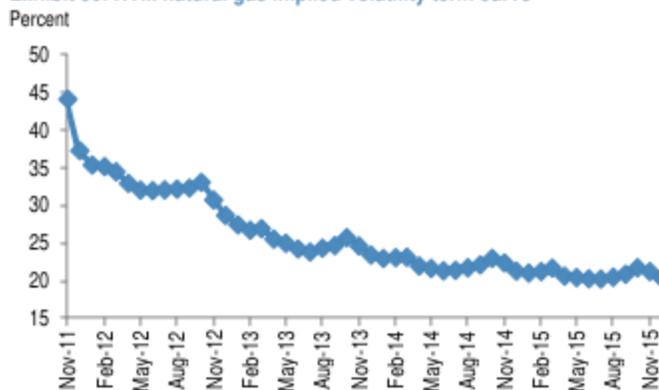
In constructing our long-run commodity views, our operating assumption is the CNY will trade around 4.0 to the USD by 2015 and at a cross of 3.0 by no later than 2020, though we defer to the JP Morgan F/X strategy team for their official forecasts.

### Implications for risk and valuation

The title of this report asks whether US natural gas will help save the world. We believe the answer is yes. US natural gas offers a potential solution for escape velocity from the current phase of the global financial mess, though any escape likely will be a bumpy ride for many years to come. This bumpiness appears absent in forward NYM natural gas options prices, where Calendar 2015 ATM straddles can be bought today for about 20% in implied volatility terms. This is a noteworthy fact, given that volatility is mean reverting, sometimes violently so in the hardest-to-store commodities, like natural gas. Among all commodity markets, only electricity is harder to store.

As the Cal2015 NYMEX natural gas contracts become more prompt, we believe Cal2015 implied vol will be substantially higher than it is priced today. Our conviction in this view is reinforced by the backwardation in the term vol curve and the historical distribution of implied volatility since 1993 (Exhibits 30 and 31). Recent measurements of actual volatility, the stage of the business cycle, the stage of the commodity supercycle (year 12 of projected 25), and the term structure of the volatility curve suggest that a roll up to 40% or higher by expiry enjoys a meaningful probability.

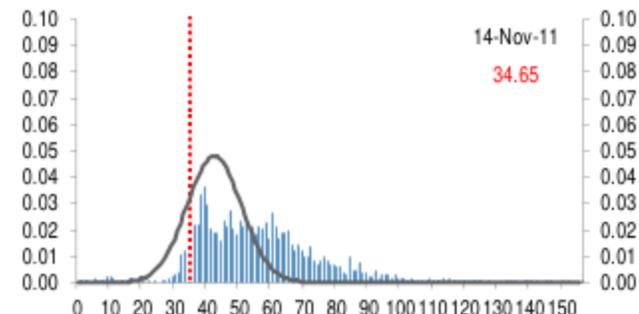
Exhibit 30: NYM natural gas implied volatility term curve



Source: J.P. Morgan Commodities Research

Exhibit 31: Implied volatility distribution of prompt NYM natural gas

Frequency by implied vol (%). Histogram since 3/16/93. Gray line=recent distribution



Source: NYM, J.P. Morgan Commodities Research

It may not take four years to get paid for taking this risk. Along the way, the entire natural gas forward curve is also likely to experience strong swoons and advances. By 2017, we believe prompt natural gas prices will be priced significantly above \$6.50 per MMBtu in the dollars of the day. We note that current producer hedges for that interval are struck in nominal dollars, not real dollars, and they make no contingency provision for the value of the Chinese renminbi or any measure of inflation. Producers face the risk of higher-than-expected received prices for their physical molecules but some potentially significant pain in their paper hedges if they are not careful in how they structure them.

North American natural gas has been experiencing a strong structural change: shale gas now accounts for about a third of US production. However, a commodity market can experience multiple structural changes at the same time. We see at least two others. The first—the opening of LNG exports—is already unfolding. The second—the leasing of Federally-held and currently off-limits parcels in the Outer Continental Shelf (OCS) for oil and gas drilling—had a chance to change course last week, but the US government chose not to exercise that option.

Specifically, on November 8, the Obama Administration announced its plan for the next 5-year cycle of OCS leasing (2012-to-2017). The government will make 15 leases available for development, with the first auction set for December 14, 2011. Importantly, the plan moots any development off the West and East Coasts, including a parcel off of Virginia that the Administration had earlier indicated would be offered. The plan does include two parcels in the Eastern Gulf of Mexico that are not in the current moratorium zone but are close to its boundary. This perhaps represents a baby step toward future development of that zone, however, those properties are not due to be auctioned until 2014 and 2017. Thus, the OCS plan as it

stands actually diminishes if not removes (for now) one of the strongest levers for getting US gas prices down even further. The inaction on OCS reduces downside price risk.

For most of the past year, industry consensus has argued that spot Henry Hub natural gas would remain range-bound between \$4.50 and \$6.50 per MMBtu due to the structural impact of shale gas. We have disputed this view, arguing that both the floor and the ceiling in this range would be violated within the next five years. We have already been proven correct on the floor violation. Spot gas is now priced at \$3.45 per MMBtu. If the Obama Administration were to tack again and surprise consensus (and us) with an aggressive opening of Eastern Gulf of Mexico leases outside of the traditional practice of the 5-year planning exercise, we would not be surprised to see flushes down to a price with a \$2 handle. Such flushes could also be spurred by a very warm winter (not our view) or a collapse in economic activity in a 2012 US recession (also not our view).

Though we have been flagging the relative value emerging in natural gas for more than a year, we have not formally recommended a long position in natural gas as a trading strategy. This has been because we have seen greater risk-reward in owning gas-related equities rather than gas commodity exposure. Indeed, the Bull/Bear relative value

(RV) framework we introduced on August 8 was short prompt NYM natural gas and other US-intensive commodities, against length in commodities geared toward Asia capex.

However, the gap between US gas prices and Asian oil prices has become very wide, and structural changes are starting to emerge to close that gap. These developments are sufficiently advanced that last week (Nov 10) we changed our tactical posture and introduced new ideas for institutional investors to consider. Specifically:

- We took off the Bear leg of the RV strategy at what would have been about a 6.5% profit for the short. We presented the idea of redeploying that capital into the Bull leg (see page 21 for list of commodities in this basket).
- We also advanced the investment idea that institutional investors buy straddles on Cal 15 NYM natural gas (k=\$5.00) and protect themselves by owning puts on Spring 2012 (k=\$3.50, NGH2, NGK2, NGJ2). So far, the puts have gained by about 8 cents per MMBtu against a 3-cent decline for the straddle, for a modest net gain.

## Hedging and investment ideas for long-dated NYM natural gas

	Strategy
<b>Producers</b>	Industry consensus has believed in a \$4.50-to-\$6.50 per MMBtu range-bound spot Henry Hub market through 2013. We have doubted these levels as hard boundaries—a skepticism that proved correct as the “floor” disintegrated since late July 2011. The permitting and financing of terminals for exporting natural gas and NGLs out of North America represents a significant structural change. Producer hedges are struck in nominal USD and reflect a price, volatility, and currency regime which is looking backward, not forward. Long-dated gas prices are vulnerable to a swift rerating to higher levels in nominal USD terms, as physical consumers look to lock in long-term physical supply contracts, tightening available supplies in forward basis markets.
<b>Consumers</b>	The myth that there is no global gas market has been put to rest. Once US consumers realize they are competing with the Chinese for forward physical molecules—which are now priced US\$100 boe below competing oil prices—forward NYM markets could tighten rapidly. We see parallels with the LME aluminum market of 1994, when a sovereign-brokered Memorandum of Understanding to cut global production by 6% at a very low price level in both absolute and relative terms led to a huge scramble for property rights on physical inventory that in turn lifted 3M aluminum prices by 80% within the year. This is a good time to layer in long-dated, options-based gas hedges.
<b>Index Investors</b>	We have argued for the inevitability of the US gas export solution for more than a year. Until now, equities have represented for most investors a better risk-adjusted vehicle for exposure to the theme. This positioning found support on the day of the BG/Cheniere announcement, when the Cheniere share price gained by 68.6% in one day, while the average loss in the NYM strip was 1.4%. However, risk is changing. We do not believe the nominal prices and volatilities embedded in the NG forward curve can remain where they are, as new domestic demand and trade pathways open up and the CNY likely appreciates by at least one-third vs. USD over the next half decade. We like the idea of buying 2015 straddles, but also see value in owning variance swaps.
<b>Tactical Traders</b>	Between August 8 and November 10, we favored a defensive, relative value (RV) strategy long a basket of commodities geared toward Asia, capex, and inflation, paired against a short or underweight in a basket of 5 commodities geared toward the US, consumption, and disinflation. The short/underweight basket included prompt NYM natural gas—our only active idea in that market at that time. Last week we exited the Bear side of this RV idea (at around a 6.5% gain) and suggested the idea of: (1) redeploying the capital into the Bull basket, (2) owning puts on Spring 2012 NYM natural gas, and (3) simultaneously buying straddles on Calendar 2015 NYM gas. We are skeptical implied vols can remain this low, even if timings and catalysts are opaque.

Source: J.P. Morgan Commodities Research

## Appendix A: Timeline of key puzzle pieces

Date	Description
20-May-11	Cheniere gets LNG export permit from the DOE. Other regulatory hurdles remain.
5-Aug-11	China National Petroleum Corp (CNPC) starts trial on the country's first horizontal shale-gas well.
5-Aug-11	CNOOC announces it intends to start operations in the Jieyang LNG import facility in Guangdong province in mid-2014.
8-Aug-11	ECB President Jean-Claude Trichet issues a statement signaling the ECB would begin buying about 2.5Bn euros worth of Spanish and Italian Bonds per day.
10-Aug-11	Citing industry sources, Reuters reports that LNG freight rates tripled in July; LNG shipments through Suez Canal rose by 89%.
16-Aug-11	China Petrochemical says it aims to have 1.7bcm of annual gas production at Yuanba field by 2013, rising to 3.5bcm by 2015.
18-Aug-11	Noble Energy agrees to pay \$1.07Bn for half of Consol Energy's Marcellus Shale properties.
22-Aug-11	China announces tax rebates on imports of natural gas from 2011 to 2020 if imported prices are higher than domestic sale prices.
23-Aug-11	The US government slashes its estimate of undiscovered Marcellus Shale natural gas by as much as 80%.
31-Aug-11	China will increase the number of shale blocks it puts up for auction.
31-Aug-11	Shell to invest \$600 million in shale gas extraction in Ukraine.
1-Sep-11	First formal meeting of the US Deficit Supercommittee convenes: all members say they know they need to do more than the statutory instruction of \$1.5Tn.
2-Sep-11	US Deficit Supercommittee member Senator Jon Kyl says that if Defense is touched he will resign from the committee. Separately, Jurgon Stark announces his resignation from the ECB. The ECB had recently agreed to purchase Spanish and Italian sovereign bonds.
6-Sep-11	Chevron signs an agreement giving it access to spare LNG import capacity at the Red Hook Terminal.
7-Sep-11	During a Republican presidential debate, Texas Governor Rick Perry states that Social Security is "a Ponzi scheme".
14-Sep-11	Conoco's CEO says the oil and gas industry may add half a million jobs by 2030.
16-Sep-11	CNOOC says it will increase LNG received at Guangdong Dapeng to 6.8mmt in 2011, up from 5.6mmt in 2010.
19-Sep-11	President Obama unveils a deficit reduction plan that includes \$580Bn in cuts to entitlement programs and in total amounts to \$4Tn, sufficient to halt growth in the national debt. However, plan includes "millionaire" taxes unlikely to pass in Congress.
19-Sep-11	British Columbia's Premier Christy Clark announces that BC would take major steps to promote LNG, including targeting three operational LNG export projects by 2020.
24-Sep-11	House Budget Chairman Paul Ryan predicts the Congressional Deficit Supercommittee will fall short of its \$1.5Tn goal.
26-Sep-11	Chevron announces it will move ahead with its \$28Bn Wheatstone LNG project in Western Australia to target Asian markets, with first fuel shipments scheduled for 2016.
10-Oct-11	Sinopec buys Canadian oil and gas producer, Daylight Energy, for \$2.1 billion.
13-Oct-11	China's Ministry of Agriculture says CNOOC will begin studying the use of LNG to power fishing boats, potentially replacing more than 70% of diesel currently being used. China reportedly has 1.06 million fishing vessels that consume more than 8mmt of diesel per year.
13-Oct-11	Canada's National Energy Board approves an LNG export license for Kilmat LNG.
14-Oct-11	Texas Governor Rick Perry announces ambitious upstream energy development plan for US. The plan seeks to create 1.2 million jobs through expanding production of domestic oil and gas.
17-Oct-11	StatOil ASA agrees to buy Brigham Exploration for \$4.4Bn (Bakken shale).
17-Oct-11	Kinder Morgan announces deal to acquire El Paso for \$38 billion (\$21Bn in cash).
19-Oct-11	PetroChina announces it is building an underground natural gas storage facility in Xinjiang (cost estimated at \$1.5 billion) to bring its total storage capacity to 10.7bcm (377bcf). Facility will be largest of its kind in China when completed in 2014.
25-Oct-11	Republican presidential candidate Rick Perry proposes a tax overhaul giving individuals the option to pay a 20% flat tax on income.
25-Oct-11	PetroChina announces LNG terminal in Dalian is "ready for operation".
26-Oct-11	China Petrochemical Corp executive announces China's shale gas output may surpass 5bcm in 2015.
26-Oct-11	GDF Suez LNG president says China will import 44mmt per year (5.68bcf per day) of LNG by 2020, surpassing South Korea as Asia's second-largest importer.
26-Oct-11	Cheniere and BG announce US\$8Bn LNG sales agreement for 3.5 million tonnes per year. BG will pay 115 percent of the Henry Hub price plus \$2.15 per MMBtu.
27-Oct-11	Dow Chemical expects competitors' factories that make plastic from naphtha will be idle or shut by the end of the year.
31-Oct-11	SOE Israel Natural Gas Lines signs accord to build \$140 million offshore LNG terminal (capacity of 2.5bcm/year) by the end of 2012 with Italy's Micoperi Srl.
8-Nov-11	The Obama Administration announced its plan for the next 5-year cycle of OCS leasing (2012-to-2017). The government will make 15 leases available for development. Importantly, the plan does not include any development off the West and East Coasts, including a parcel off of Virginia that the Administration had earlier indicated would be offered. The plan does include two parcels in the Eastern Gulf of Mexico that are not in the current moratorium zone.

Source: Company reports, Bloomberg, Reuters, J.P. Morgan Commodities Research

## Appendix B: Gas excerpts from China's 12th 5-Year Plan

**"Promote diversified and clean energy sources:** Strengthen the exploration and development of petroleum and natural gas resources, stabilize domestic petroleum output, and promote the rapid growth of natural gas output and the development and utilization of unconventional oil and gas resources, such as coal-bed gas and shale gas."

**"Strengthen energy transmission channels:** Accelerate the construction of strategic transmission channels in China and improve the domestic trunk oil and gas pipeline network. Unify planning of natural gas import pipelines, LNG receiving stations, and cross-regional trunk gas transmission and distribution networks, and create a gas supply layout in which natural gas and coal based gas are balanced."

**"Build out oil and gas pipeline networks:** Construct the China-Kazakhstan crude oil pipeline (Phase 2), the China-Myanmar oil and gas pipeline (domestic section), the Central Asia natural gas pipeline (Phase 2), and the West-to-east Gas Transmission Lines 3 and 4. Accelerate the construction of gas storage facilities."

**"Energy consumption per unit of GDP will decrease 16% and CO2 emissions per unit of GDP will decrease 17%:** Improve the incentive mechanism of energy conservation and emission reduction, optimize energy consumption structure, improve pricing mechanisms and taxation, and strengthen the related laws, regulations and standards."

**"Upgrade bulk vessels, oil tankers, and container vessels to international standards:** Improve the ship equipment industry and loading rate, prioritizing LNG and LPG vessels."

**"Optimize energy development:** Construct five national integrated energy bases in Shanxi, the Ordos Basin, eastern Inner Mongolia, SW China and Xinjiang. Improve local energy processing and transformation to reduce the pressure of large-scale and long-distance energy transmission. Construct energy storage facilities, improve the petroleum reserve system, and strengthen the capacity of natural gas and coal reserves."

**"Stabilize oil output and increase gas output:** Create 5 large-scale oil and gas producing areas in the Tarim and Junggar Basins, the Liaosong Basin, the Ordos Basin, the Bohai Bay Basin and the Sichuan Basin. Accelerate the exploration and development of offshore and deepwater oil and gas fields, and strengthen the production and utilization of coal-bed gas in coal mine areas. Increase oil refining capability appropriately."

**"Improve the mechanism for setting prices for resource products:** Press ahead with progressive pricing for household electricity and water consumption. Make the price ratio of natural gas to alternative energy sources more reasonable."

**"Build out the power grid:** Accelerate construction of outward power supply projects from large coal power, hydropower and wind power bases, and create some cross-regional power transmission channels using advanced technologies. Complete 200,000km of power transmission lines, upgrade substations to smart-substations, increase use of smart meters, and construct EV charging facilities."

## Price Forecasts

## USD, quarterly averages

	Units	Current Price	2010 average	2011				2011 average	2012				2012 average
				1Q	2Q	3Q	4Q		1Q	2Q	3Q	4Q	
<b>Energy</b>													
WTI Crude	US\$/bbl	99.37	79.61	94.60	102.34	89.54	90.00	94.12	90.00	90.00	100.00	110.00	97.50
<i>forward price</i>								99.37	96.46	99.35	98.91	98.19	97.55
Brent Crude	US\$/bbl	112.39	80.34	105.52	116.99	112.09	115.00	112.40	115.00	110.00	115.00	120.00	115.00
<i>forward price</i>								112.39	111.75	111.75	110.61	109.51	108.22
Natural Gas	US\$/MMBtu	3.40	4.38	4.20	4.38	4.05	3.75	4.18	3.95	3.50	4.25	4.70	4.10
<i>forward price</i>								3.40	4.01	3.55	3.61	3.72	3.96
<b>Precious Metals</b>													
Gold	US\$/t oz.	1782	1228	1388	1508	1703	2150	1696	1925	1875	1850	1825	1869
<i>forward price</i>								1782	1595	1784	1784	1787	1790
Silver	US\$/t oz.	34.46	20.24	31.95	38.32	38.81	35.80	36.40	35.00	34.10	33.60	33.20	34.00
<i>forward price</i>								34.45	35.88	34.50	34.13	34.17	34.21
Platinum	US\$/t oz.	1643	1614	1793	1788	1773	1900	1822	1900	1900	1925	1935	1915
<i>forward price</i>								1785	1643	1648	1651	1655	1649
Palladium	US\$/t oz.	667	530	790	760	752	800	783	820	840	860	880	850
<i>forward price</i>								667	742	669	670	670	670
<b>Base Metals</b>													
Aluminum	US\$/mt	2114	2178	2511	2603	2404	2200	2448	2350	2450	2550	2600	2500
<i>forward price</i>								2114	2408	2117	2129	2155	2184
Copper	US\$/mt	7677	7548	9634	9152	8979	7250	8791	8250	8500	9250	9000	8750
<i>forward price</i>								7686	8863	7686	7695	7700	7695
Nickel	US\$/mt	17547	21823	26913	24181	22010	18000	22860	20000	21000	22000	22000	21250
<i>forward price</i>								17811	22729	17556	17569	17582	17585
Zinc	US\$/mt	1906	2163	2399	2254	2227	1900	2215	2000	2100	2150	2200	2113
<i>forward price</i>								1906	2197	1907	1927	1947	1965
Lead	US\$/mt	1991	2152	2592	2546	2452	2000	2397	2175	2250	2275	2300	2250
<i>forward price</i>								1991	2395	2005	2024	2042	2059
Tin	US\$/mt	21165	20418	29927	28598	24630	20500	25989	22500	23000	24000	25000	23625
<i>forward price</i>								21165	26080	21176	21194	21208	21220
<b>Agriculture</b>													
Corn	US\$/bu	6.46	4.30	6.70	7.31	6.96	6.40	6.80	6.70	7.00	6.80	6.30	6.70
<i>forward price</i>								6.46	6.86	6.55	6.61	6.36	6.34
CME Wheat	US\$/bu	6.33	5.86	7.86	7.45	6.90	6.50	7.22	6.90	7.20	7.10	7.30	7.10
<i>forward price</i>								6.33	7.13	6.48	6.64	6.90	6.82
Soybeans	US\$/bu	12.00	10.49	13.79	13.61	13.56	12.70	13.40	13.10	13.40	13.20	12.70	13.10
<i>forward price</i>								13.65	12.05	12.20	12.23	12.11	12.15
Soybean Oil	US cents/lb	52.60	42.12	56.98	57.21	55.72	51.80	55.50	54.40	52.80	53.40	56.00	54.20
<i>forward price</i>								52.60	55.63	53.02	53.53	53.87	53.71
Soybean Meal	US\$/short ton	301.4	299.5	367.2	353.2	352.4	325.0	350.2	358.3	354.3	366.8	337.8	354.3
<i>forward price</i>								301.4	343.56	304.8	309.4	313.6	309.7
Sugar	US cents/lb	24.81	22.28	30.50	24.46	28.68	23.50	26.78	22.00	21.50	21.50	21.00	21.50
<i>forward price</i>								27.88	24.81	24.16	23.75	23.65	24.09

Source: Exchanges, J.P. Morgan Commodities Research. Data as of close on November 15, 2011. Forward prices are the average of the contracts in the quarter.

## Ideas for institutional investors

### Active trading ideas

Marked as of: 15-Nov-11	Date of recommendation	Cost*	Last closing price	Change since recommendation
<b>Long Dec-11 CMX Gold</b>	25-Feb-2011	1421.10	1782.20	25.4%
<b>Long CY2013 Brent call options (k = 125)</b>	23-Feb-2011	7.30	7.53	0.23
<b>Long put on Spring 2012 NYM natural gas (k = 3.50, contracts NGH2, NGJ2, NGK2)</b>	10-Nov-2011	0.17	0.25	0.08
<b>Long Cal 2015 straddle in NYM natural gas (k = 5.00)</b>	10-Nov-2011	1.54	1.51	-0.03
<b>New Bull basket</b>	10-Nov-2011	100.0	100.7	0.7%
ICE Brent crude oil (COH2)				0.1%
ICE gasoil (QSH2)				1.5%
CMX gold (GCG2)				1.3%
ICE raw sugar (SBH2)				-2.3%
LME copper (LPH2)				2.8%
CBT corn (C H2)				0.0%
MGE wheat (MWH2)				1.3%
<b>Long S&amp;P GSCI Total Return</b>	30-Sep-2010	4303.80	5056.00	17.5%
<b>Long S&amp;P GSCI Enhanced TR</b>	30-Sep-2010	621.52	737.89	18.7%
<b>Long JPM Commodity Curve TR</b>	30-Sep-2010	443.75	504.60	13.7%

Source: Exchanges, J.P. Morgan Commodities Research. \*Unit cost is the official close on the day before the date of publication. All ideas and calculated changes are for informational purposes to track the performance of ideas. None are actual investments. "Bull basket" was originally one-half of a relative value strategy introduced on August 8, 2011 as a means to manage near-term financial market turbulence related to the sovereign debt challenges in Europe and the United States. "Bear basket" idea was closed on November 10, 2011 at a 6.5% implied return net of trading costs, with the theoretical capital redeployed to Bull basket, by doubling the quantity exposures. Due to imminent expiries, in establishing the New Bull Basket, we are using March contracts rather than in December.

### Commodity total return forecast tables

Commodity total returns	2008	2009	2010	2011 YTD	Forecast Next 12 Months
<b>S&amp;P GSCI</b>	<b>-46.5</b>	<b>13.5</b>	<b>9.0</b>	<b>2.3</b>	<b>15.0</b>
<b>Energy</b>	<b>-52.4</b>	<b>11.2</b>	<b>1.9</b>	<b>8.3</b>	<b>19.0</b>
<b>Non-Energy</b>	<b>-31.1</b>	<b>16.9</b>	<b>26.3</b>	<b>-9.7</b>	<b>6.9</b>
Industrial Metals	-49.0	82.4	16.7	-20.8	8.0
Precious Metals	0.5	25.1	34.5	22.8	4.5
Agriculture	-28.9	3.8	34.2	-13.7	8.5
Livestock	-27.4	-14.1	10.5	2.1	2.0
<b>JPMCCI</b>	<b>-35.0</b>	<b>20.5</b>	<b>13.8</b>	<b>-0.2</b>	<b>17.0</b>
<b>Energy</b>	<b>-42.3</b>	<b>10.4</b>	<b>0.6</b>	<b>5.7</b>	<b>22.0</b>
<b>Non-Energy</b>	<b>-27.4</b>	<b>30.3</b>	<b>27.8</b>	<b>-5.2</b>	<b>12.1</b>
Industrial Metals	-45.8	80.6	16.1	-19.1	15.0
Precious Metals	-4.6	28.2	39.0	20.3	6.0
Agriculture	-21.1	10.1	35.5	-7.4	14.5
Livestock	-24.3	-12.7	15.3	3.1	2.0
<b>S&amp;P GSCI Enhanced</b>	<b>-41.1</b>	<b>21.6</b>	<b>12.2</b>	<b>3.6</b>	<b>16.0</b>
<b>DJ-UBS</b>	<b>-35.7</b>	<b>18.9</b>	<b>16.8</b>	<b>-8.2</b>	<b>12.0</b>

Source: S&P, DJ, Exchanges, J.P. Morgan Commodities Research. Note: total returns are gross returns before fees, data as of 15-Nov-11.

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