

# Some Thoughts on LNG Prices

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# Topics

- Data sources and methods for determining FOB Coal Prices
- Sources of LNG Price Data (ex-ship and DES) and Methods of Price Determination
- Calculations and comparisons of Asian LNG prices from different sources
- Summary

**FOB steam coal price indices used in Asia**

## Newcastle Price Indices

–Plenty of Indices to go around for the same 6000 NAR brand

Coal Index	Start Year	Maximum delivery period	Minimum Cargo
		Days	Tonnes
gcNEWC	2002	90	Unstated
NEX	1986	180	25,000
Platts "90 Day Forward NEWC Price Assessment"	2006	90	25,000
McCloskey Newcastle	2001	90	50,000
API 6	2001	90	Panamax
JPU	1998	Up to 1 year	Unstated

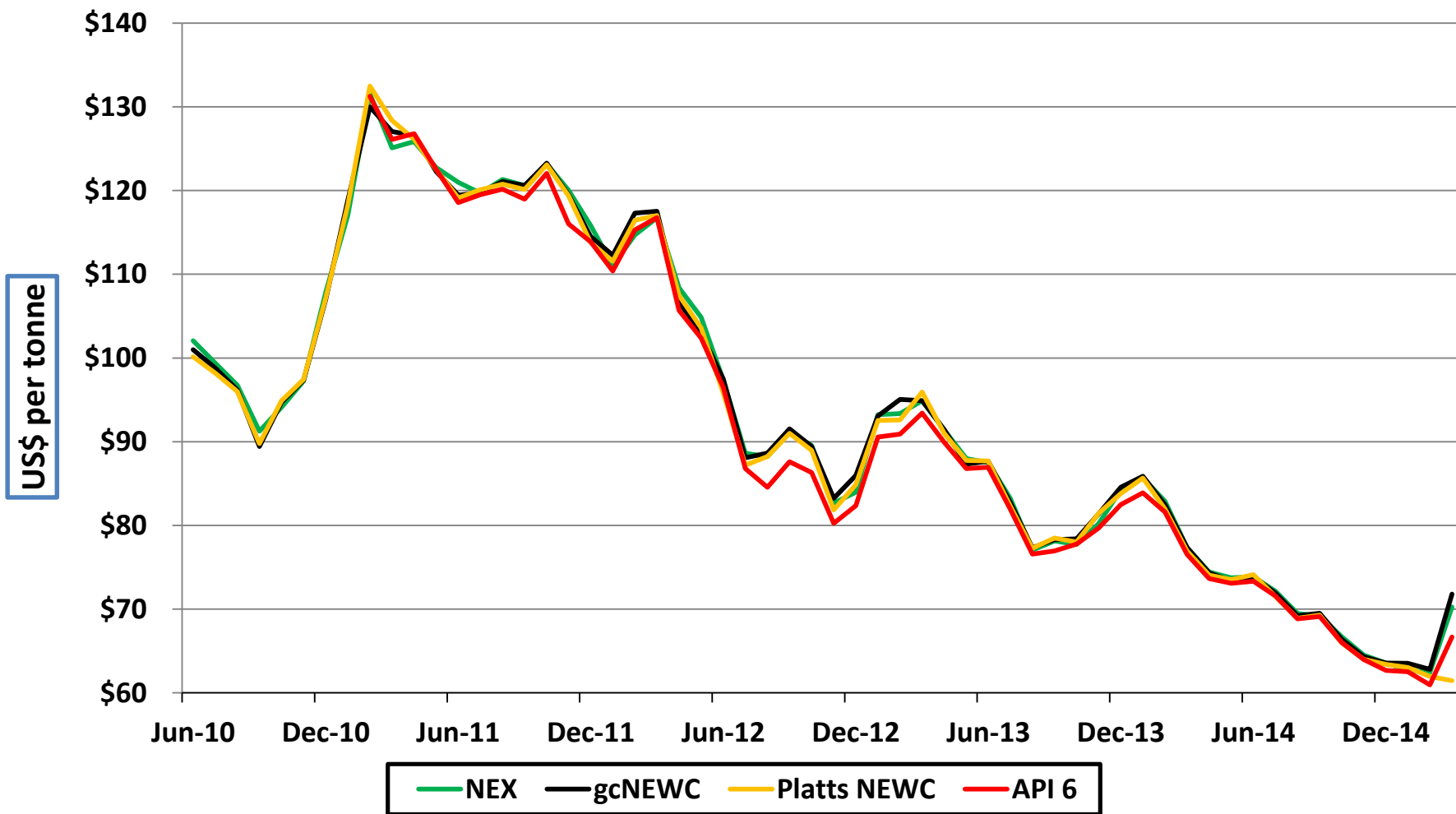
Except for globalCOAL, which specifies typical and min-max values for CV, TM S, Ash and VM, the others provide only partial specifications.

### Examples

- No CV min value for NEX and Platts
- Lack of TM values for NEX and Platts and no VM value for Platts.
- Lack of typical values for S and ash for Platts and Argus and no reporting basis for S and Ash for Platts

	globalCOAL gcNEWC	Energy Pub. NEX	Platts Newcastle	Argus API 6
CV (kcal/kg) Typical / Min	6000 / 5850 nar	6700 /? gad	6300 /? gar	6000 / 5700 nar
Total Moisture Typical / Max	10% / >15% (ar)	n/a	n/a	? / >18% (ar)
Sulfur Typical / Max	0.6% / >0.75% (ar)	? / >0.80% (ad)	? / >0.70% (?)	? / >1% (ad)
Ash Typical / Max	13% / >14% (ar)	? / >15% (ad)	? / 13% (?)	? / >18% (ad)
Volatile matter Typical / Min	<27% or >35% (ar)	? / <30% ad)	n/a	<22% or >37%) (ad)

Over the past 2 ½ years, four competing Newcastle Coal Price indices with 6000 NAR equivalent CVs have tracked each other closely, except for the period July-Sept 2012 and February 2015.



# The number of Indonesian Coal Price indices has “exploded” from 2006 onwards with new private sector indices being added every few months.

Indonesian Coal Index	Start Year	CV	TM (ar)	S	Ash	VM	Latest Shipment Date	Minimum Cargo Size
		Price Basis	Maximum	Maximum	Maximum	Min-Max	Days after Index Published	Tonnes
<b>Platts "90 Day Forward Indonesia Price Assessments"</b>								
* Kal 5900	2006	5900 (gar)	n/a	1.0% (?)	15% (?)	n/a	90	25,000
* Kal 5000	2006	5000 (gar)	n/a	0.8% (?)	8% (?)	n/a	90	25,000
Platts "Daily FOB Kalimantan 4200 GAR"	Jul-12	4200 (gar)	35%	1.0% (ar)	7% (ar)	n/a	45	50,000
"McCloskey Indonesian Sub-Bit 4900 NAR"	Jul-10	4900 (nar)	28%	1.0% (ad)	10% max (ad)	40% typ. (ad)	90	50,000
<b>Argus-Coalindo</b>								
* ICI 1 (6500 GAR)	2006	6500 (gar)	12%	1.0% (ar)	12% (ar)	n/a	90	Panamax
* ICI 2 (5800 GAR)	2006	5800 (gar)	18%	0.8% (ar)	10% (ar)	n/a	90	Panamax
* ICI 3 (5000 GAR)	2006	5000 (gar)	30%	0.6% (ar)	8% (ar)	n/a	90	Panamax
* ICI 4 (4200 GAR)	Jul-08	4200 (gar)	40%	0.4% (ar)	6% (ar)	n/a	90	Barge/nov Mother Vsl
* ICI 5 (3400 GAR)	Dec -11	3400 (gar)	50%	0.2% (ar)	4% (ar)	n/a	90	Mother Vessel

# LNG Pricing in Asia



## Comparison of Primary Source Data for Determining Asian LNG Prices (Paid Subscription Data Sources)

<b>Index</b>	<b>Start Year</b>	<b>Price Basis</b>	<b>Frequency of Publication</b>	<b>Price Discovery Method</b>
<b>Platt's JKM</b>	<b>2009</b>	<b>DES, Japan-Korea</b>	<b>Daily</b>	<b>Survey</b>
<b>Argus Global LNG/ LNG Daily</b>	<b>2005/2011</b>	<b>DES, Japan SE Asia</b>	<b>Monthly/Daily</b>	<b>Survey</b>
<b>IHS/Waterborne</b>	<b>2013</b>			<b>Survey + Analyst Review</b>
<b>ICIS</b>	<b>?</b>	<b>DES, East Asia</b>	<b>Daily/Weekly</b>	<b>Survey + Calculations</b>

## Primary Data Sources for Free LNG Information that can be used to determine Asian LNG Prices

Name of Price Index	Start Year	Price Basis	Freq. of Publication	Source
1. Japanese Customs Cleared Crude (JCC) (Term)	2008	DES, Japan	Monthly, 2 months in arrears	<b>Petroleum Assoc. of Japan</b> <a href="http://www.paj.gr.jp/english/statistics/">http://www.paj.gr.jp/english/statistics/</a> (click on #07)
2. Contracted / Arrival LNG Prices (Spot)	March 2014	DES, Japan	Monthly	<a href="http://www.meti.go.jp/english/statistics/sho/slng/">www.meti.go.jp/english/statistics/sho/slng/</a>
3. Henry Hub (Spot or Term)	1997	Henry Hub, Erath, La.	Daily, weekly, monthly, annually	US DOE EIA <a href="http://www.eia.gov/dnav/ng/ng_pri_fut_s1_d.htm">http://www.eia.gov/dnav/ng/ng_pri_fut_s1_d.htm</a>
4. Dated Brent (Spot)	1987	FOB, spot	Daily, weekly, monthly, annually	US DOE EIA <a href="http://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm">http://www.eia.gov/dnav/pet/pet_pri_spt_s1_d.htm</a>

## Primary Data Sources for Free LNG Information or Data that can be used to determine Asian LNG Prices

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1. Contracted / Arrival LNG Prices (Spot)	March 2014	DES, Japan	Monthly	<a href="http://www.meti.go.jp/english/statistics/sho/slng/">www.meti.go.jp/english/statistics/sho/slng/</a>
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# Oil-linked Japanese LNG Price Structure

- JCC \* coefficient + fixed cost = LNG Price (DES)
  - JCC = USD/bbl
  - Coefficient or slope typically set at 0.145
  - Fixed cost – US\$ 0.80 – US\$ 1.00

## Slope explained

- BBL Crude = 5.8 mmmbtu (HHV) and at 100% HV parity, the slope of the LNG Price Line = 0.173.
- Lower value of 0.145 allows for:
  - a fixed cost component (\$0.80 - \$1.00 per mmmbtu) + market conditions
  - S-curve or floor-ceiling price caps have in the past resulted in variable slopes for the pricing LNG under the same contract.
  - Slope has ranged in the past from 0.06 to 0.16 depending on market conditions and whether an S-curve pricing arrangement was applied under the contract

# Henry Hub Linked LNG Pricing ala Sabine Pass MSA

$$\text{LNG Price (FOB)} = 1.15 * \text{HH}_p + \text{Constant}$$

- 1.15 is to cover costs of transport from HH to Sabine Pass terminal and gas consumed in Sabine Pass liquefaction plant
- Constant = \$2.25 / mmbtu, covers Capex and O&M at Sabine Pass liquefaction plant; \$3.00 /mmbtu at Chieriere's Corpus Christy plant

$$\text{LNG Price (DES Japan)} = 1.15 * \text{HH}_p + \text{Constant} + \text{Shipping Cost}$$

# Comparison of JKM and HH Prices for LNG DES, Japan (note JKM Sept-Dec are futures prices)

<b>JKM</b>			
	<b>USD/mmbtu</b>		
	<b>2015</b>	<b>2014</b>	<b>2013</b>
Jan	\$10.06	\$18.96	\$15.63
Feb	\$9.91	\$18.81	\$17.35
Mar	\$7.44	\$19.42	\$19.14
Apr	\$7.28	\$18.11	\$17.64
May	\$7.38	\$15.56	\$15.46
June	\$7.12	\$15.63	\$14.49
July	\$7.60	\$12.95	\$14.57
August	\$7.40	\$11.37	\$15.46
Sept		\$10.70	\$16.01
Oct		\$12.83	\$15.24
Nov		\$14.42	\$15.86
Dec		\$12.49	\$17.69
<b>Average</b>	<b>\$8.11</b>	<b>\$15.10</b>	<b>\$16.21</b>

<b>METI Spot Data (Contract Based)</b>		
	<b>USD/mmbtu</b>	
	<b>2015</b>	<b>2014</b>
Jan	\$10.20	
Feb	\$7.60	
Mar	\$8.00	\$18.30
Apr	\$7.60	\$16.00
May	\$7.60	\$14.80
June	\$7.60	\$13.80
July	\$7.90	\$11.80
August	\$8.10	\$11.40
Sept		\$13.20
Oct		\$15.30
Nov		\$14.40
Dec		\$11.60
<b>Average</b>	<b>\$8.08</b>	<b>\$14.06</b>

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Nov		\$14.42	\$15.86
Dec		\$12.49	\$17.69
<b>Average</b>	<b>\$8.11</b>	<b>\$15.10</b>	<b>\$16.21</b>

HH			
	USD/mmbtu		
	2015	2014	2013
Jan	\$7.93	\$10.21	\$8.77
Feb	\$7.80	\$11.70	\$8.77
Mar	\$7.75	\$10.43	\$9.33
Apr	\$7.50	\$10.16	\$9.74
May	\$7.78	\$10.07	\$9.59
June	\$7.70	\$10.08	\$9.35
July	\$7.77	\$9.46	\$9.11
August	\$7.35	\$9.30	\$8.89
Sept		\$9.31	\$9.11
Oct		\$9.15	\$9.18
Nov		\$9.54	\$9.13
Dec		\$8.80	\$9.82
<b>Average</b>	<b>\$7.70</b>	<b>\$9.85</b>	<b>\$9.23</b>

Comparison of LNG Prices derived from JCC and HH “standard” price calculation equations show the price advantage that Asian LNG buyer would have gained in 2014 if they had linked the price of LNG to HH. However, this price advantage disappeared in 2015.

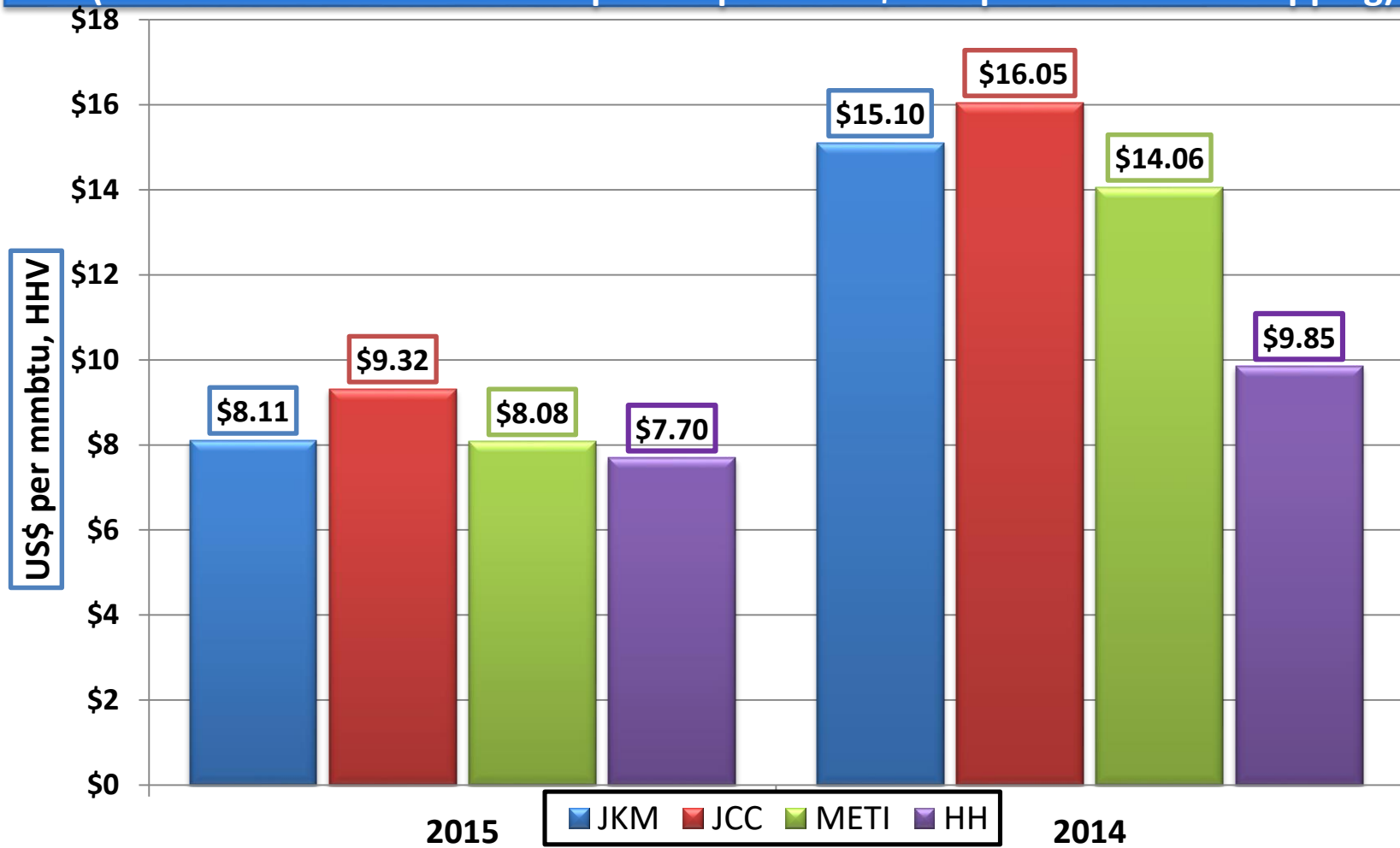
<b>JCC</b>		
	<b>USD/mmbtu</b>	
	<b>2015</b>	<b>2014</b>
Jan	\$9.99	\$17.26
Feb	\$7.98	\$16.89
Mar	\$8.74	\$16.77
Apr	\$8.94	\$16.68
May	\$9.41	\$16.63
June	\$10.09	\$16.75
July	\$10.06	\$16.98
August		\$16.83
Sept		\$16.20
Oct		\$15.40
Nov		\$13.97
Dec		\$12.24
<b>Average</b>	<b>\$9.32</b>	<b>\$ 16.05</b>

<b>HH</b>			
	<b>USD/mmbtu</b>		
	<b>2015</b>	<b>2014</b>	<b>2013</b>
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<b>Average</b>	<b>\$7.70</b>	<b>\$9.85</b>	<b>\$9.23</b>



In 2014, Asian LNG buyers would have had a huge price advantage if their FOB prices were linked to HH . However, during 2015, that price advantage had reduced considerably .

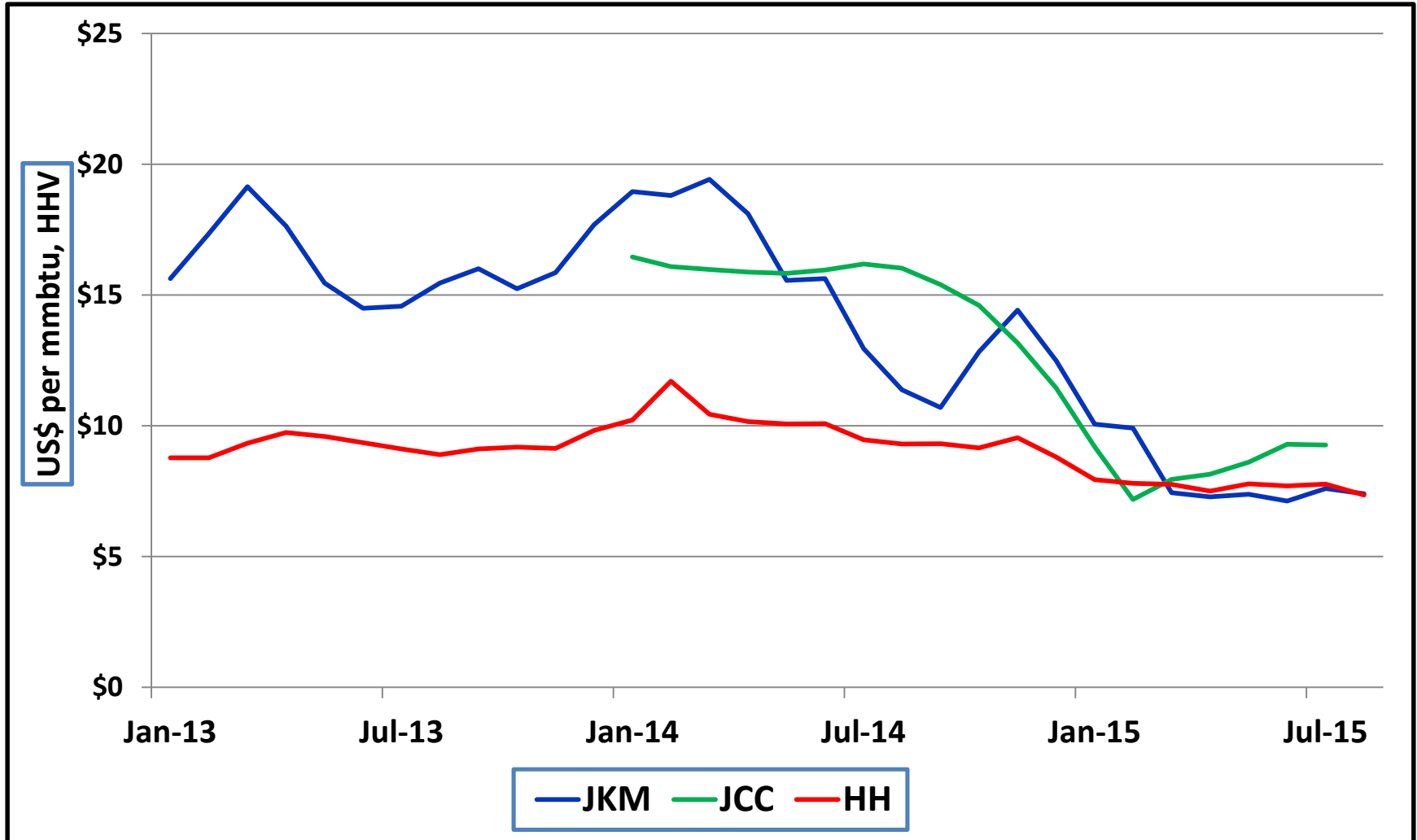
(HH Prices based Sabine Pass price equation + \$2.00 per mmbtu for shipping)



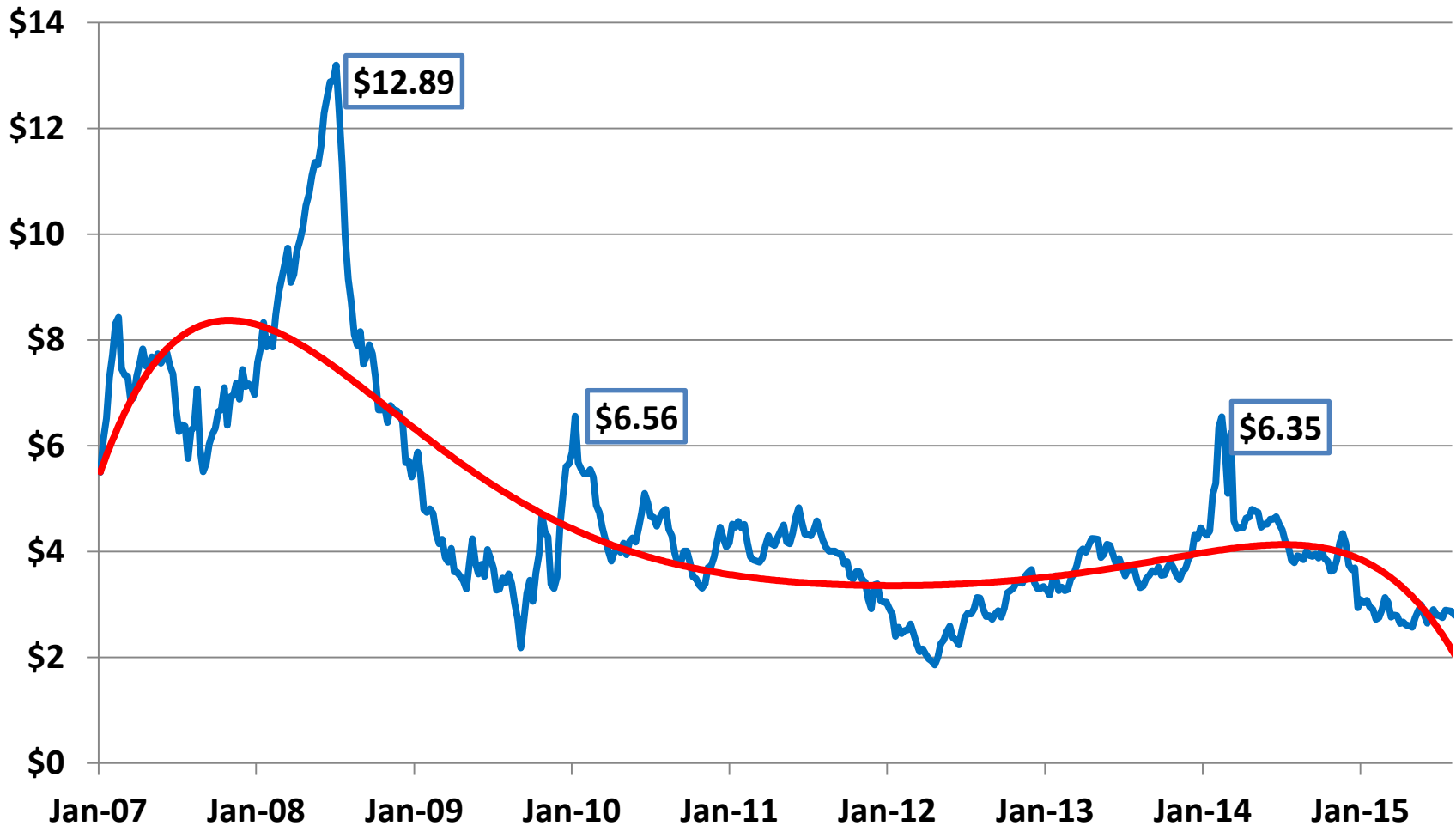
# Issues with HH Linkage

- HH Prices adjust over time in response to factors that have very little to do with Asian LNG supply and demand factors.
- The potential for a major disconnect between HH linked LNG prices and Asian-crude linked or survey determined prices is more than high; it is a certainty.
- In the past, HH has exceeded LNG prices in Asia by wide margin while LNG prices were subdued.
- The following slide shows the volatility of HH prices between 1997 and July 2015.

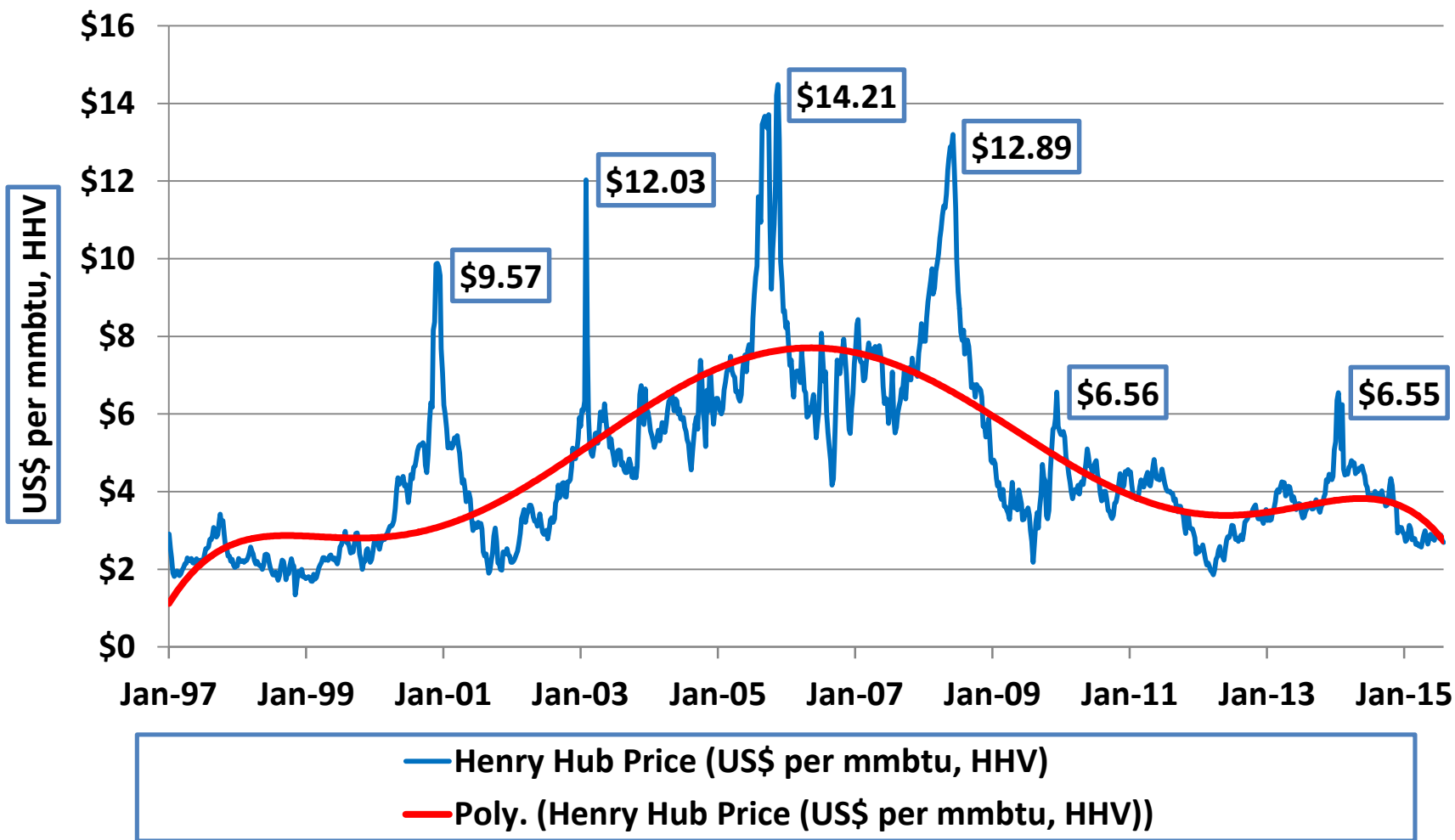
Between 2013 and July 2015, LNG DES Japan prices based on HH have been low and expected to remain that way over the long-term but be careful....



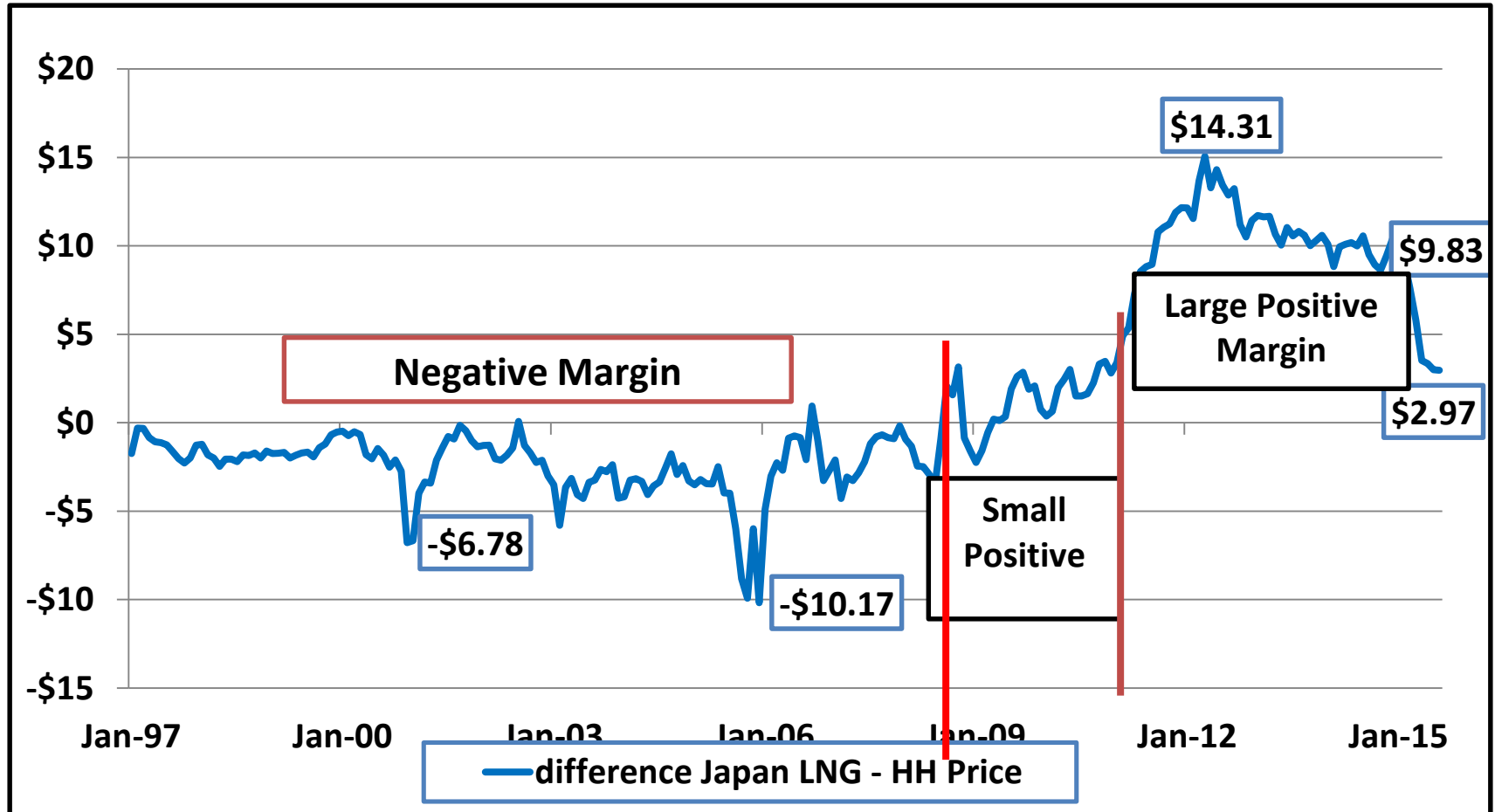
Between 2007-08: US investors built LNG receiving terminals due to high HH prices which by August 2009 had collapsed to \$2 per mmbtu. Import terminals even those already constructed were then converted into LNG export terminals. There is no reason why a reversal of today's low HH prices cannot happen in the future.



Between Jan 1997 and July 2015, the HH Index was very volatile, which created high price risk for Asian LNG buyers who chose to link their LNG prices to HH on Sabine Pass terms.



The difference between the Japanese LNG price and the HH Price + allowances for plant gas use and capex is negative from Jan 97 - June 08.



## Summary

- Now that Asian LNG prices have “collapsed” and are trading at more reasonable levels, talk about using HH prices to determine Asian LNG prices has “gone mighty quiet”.
- As of September 2015, any price advantage enjoyed by HH price linkage has largely disappeared.
- Going forward, LNG prices are expected to remain weak through 2020 due to a flood of new LNG coming from Australia, the US, Qatar and possibly Mozambique.
- LNG and oil price data from which LNG prices can be estimated are available from numerous sources for free. Even Platts issues free monthly news articles stating the monthly JKM.
- However, Platts, Argus, ICIS, IHS and others offer excellent reviews of the LNG market, which may make subscribing to their newsletters and reports worth the price + you receive more timely LNG price data.