

Asia Economics Flash

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Introducing the Goldman Sachs China Commodity Index

- In this article, we introduce the Goldman Sachs China Commodity Index (GSCCI), a weekly indicator of upstream price movement in China.
- The GSCCI is a weighted average of domestic prices of four commodities: steel, coal, aluminum, and copper.
- Compared with global commodity price indices such as the S&P Goldman Sachs Commodity Index and the official PPI figure, we believe the GSCCI reflects China's domestic demand changes better and timelier.
- The latest readings of the GSCCI suggest that upstream inflationary pressures are building up, mainly reflecting buoyant domestic activities.

In recent years, strength in commodity prices has often been associated with strength in the Chinese economy. S&P Goldman Sachs Commodity Index (GSCI), a daily global commodity index, is closely followed by market practitioners, often to take their cues of what is happening in the Chinese demand, although the weighting and components of this index are not designed to capture marginal demand changes in China. On the other hand, the Chinese official PPI data is available only once a month, and its quality is also uncertain.

In this article, we introduce the Goldman Sachs China Commodity Index (GSCCI), a weekly indicator of upstream price movement in China. It comprises four domestic commodities: steel, coal, aluminum, and copper, and its weights are estimated using China's consumption values. We believe the GSCCI provides investors with a better and timelier price index to track China's domestic demand changes.

The latest readings of the GSCCI suggest domestic price pressures on these key domestic commodities are on the rise, consistent with other macro data points indicating buoyant domestic activities.

Why build a China commodity price index?

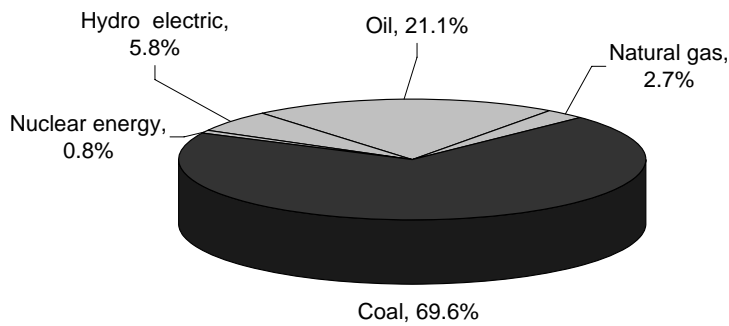
Because we believe a high frequency domestic commodity price index is valuable for investors to capture the latest marginal movements in domestic industrial activities. Our China Commodity Index differs from that of global commodity index in terms of:



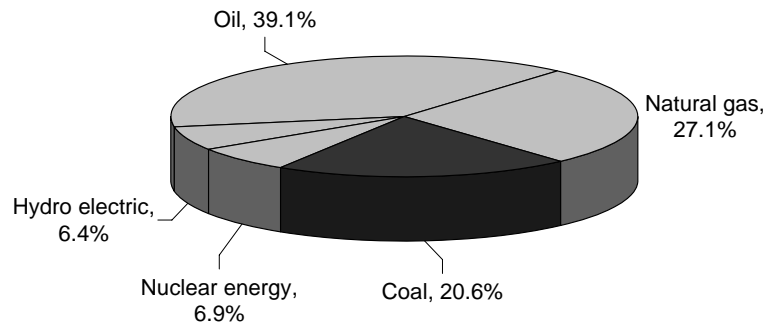
1. **Choice of components:** the China Commodity Index picks commodities that have significant importance to China’s industrialization and urbanization process, even though they may be less important in the global commodity trade; for example, coal and steel.
2. **Weighting:** the weightings of the China Commodity Index are based on China’s commodity consumption patterns, which can be very different from that of the rest of the world. For example, coal provides about 70% of China’s energy consumption, compared with 21% in the rest of the world (see Exhibit 1).
3. **Choice of price series:** our China Commodity Index uses domestic commodity prices which can be significantly different from international prices, especially in the short run. Exhibit 2 illustrates this point again with the price of coal.

Exhibit 1: Coal is a much more important source of energy to China compared with the rest of the world

Structure of China Energy Consumption (2005 data)

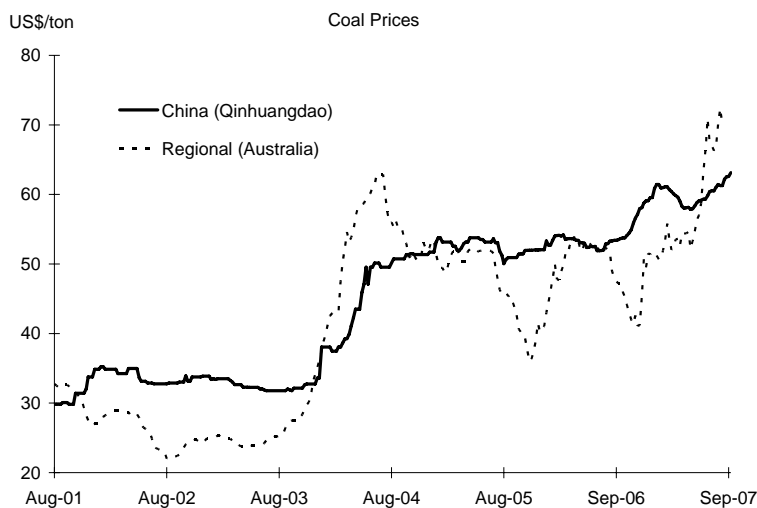


Structure of World Energy Consumption(2005 data)



Source: BP Statistical Review, Goldman Sachs Economics Research.

Exhibit 2: China's domestic coal prices can be significantly different from international prices



Source: GlobalCoal, China Coal Information Center, Goldman Sachs Economics Research.

On the other hand, the official PPI, although it has the advantage of surveying China-specific prices, it is only available on a monthly basis and is released with a long lag of 10-25 days after the end of each month.

Exhibit 3: Comparing the GSCCI with other upstream price indices

<u>Indicator</u>	<u>GSCCI</u>	<u>S&P GSCI</u>	<u>PPI</u>
Compiled by	GS	S&P and GS	NBS
Frequency	Weekly	Daily	Monthly
Weighting	Disclosed	Disclosed	Undisclosed
Prices	Domestic	International	Domestic
Weighting	Domestic consumption value	International production volume	Domestic sales value

Source: Standard & Poor's, National Bureau of Statistics, Goldman Sachs Economics Research.

How is the GSCCI compiled?

The GSCCI is a composite price index of the following four commodities (see Box 1 for a discussion on why some other commodities are not selected):

Coal is the most important source of China's energy consumption and its share has been rising in recent years due to higher oil prices. We use the price of coal produced in Shanxi province (the biggest coal producing province) reported at the port of Qinhuangdao (a key seaport in northern Hebei province) for the 2000-2007 period and Australian Newcastle coal prices before that.

Steel is by far the most important metal used in China's industrialization and urbanization. We use the average price of domestic hot roll and rebar prices to capture the demand from production and construction activities respectively.

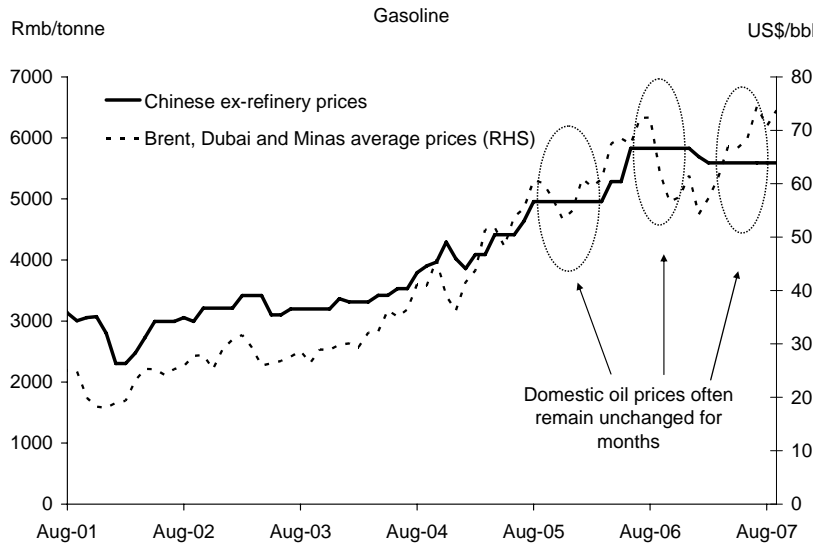
Aluminum is widely used in construction and manufacturing of transportation equipment. We use the Shanghai Changjiang Non-ferrous Metals Market spot prices since 2004 and LME spot price before that.

Copper is another important commodity used in construction and the power industry. Data source is the same as that of aluminum.

Box: Why some commodities are not selected?

Oil: although oil is undoubtedly a very important source of fuel as well as raw material for chemical products, its price is still tightly regulated in China under opaque rules and regulations. Hence, it does not provide a timely reading of domestic market conditions (see Exhibit B1).

Exhibit B1: Domestic oil prices are adjusted infrequently under government regulations

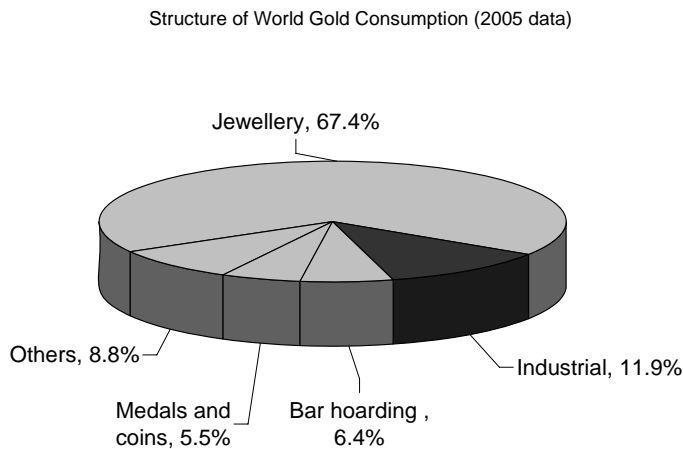


Source: DataStream, Platts, company data, Goldman Sachs Economics Research.

Cement can be a useful indicator of construction activities. However, the domestic markets are heavily segregated and there is no reliable weekly price data.

Gold is an important commodity on many fronts. However, industrial usage of this metal is limited (see Exhibit B2).

Exhibit B2: Industrial demand accounts for only 12% of gold consumption



Source: World Gold Council, Goldman Sachs Economics Research.

Weighting of each commodity in the index

The overall index is a geometrically-weighted average of the four commodities' price indices. We assign weights to each component based on the value of its domestic consumption, which equals domestic production + net exports + inventory changes. The weights are adjusted annually.

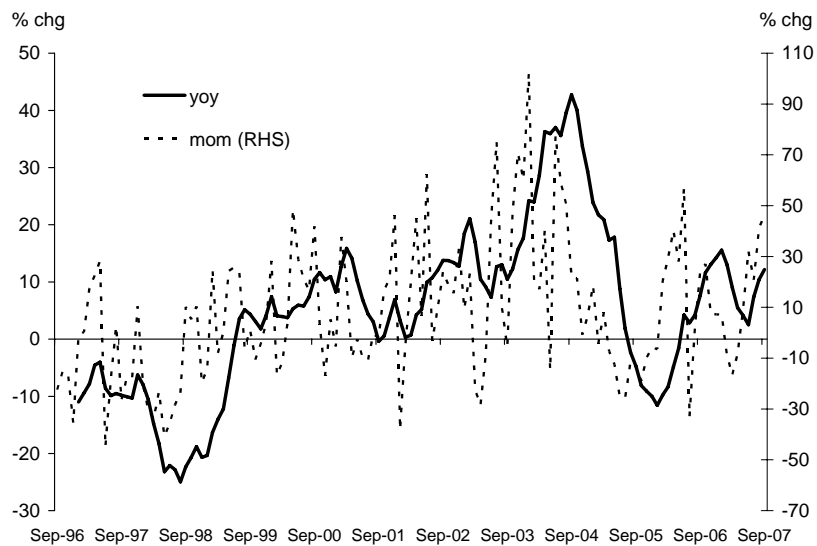
Current weights of the GSCCI are:

- Coal: 45.7%
- Steel: 41.5%
- Aluminum: 6.3%
- Copper: 6.5%

What does the latest GSCCI tell us?

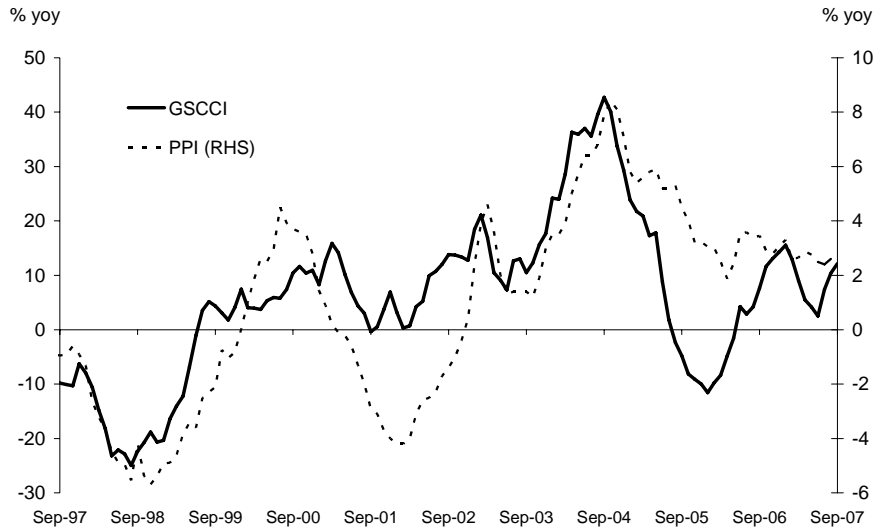
Upstream inflation pressures have been building up. The GSCCI has been accelerating on a sequential basis for several months and the latest year-on-year (yoy) reading picked up as well (see Exhibit 4). Statistical analysis shows that the GSCCI leads PPI and CPI inflation by two months (see Exhibits 5 and 6) [for details on the statistical analysis please refer to the Appendix]. Therefore, we believe the recent pickup in the GSCCI is likely a prelude to a pickup in PPI and CPI inflation in the coming months.

Exhibit 4: Both yoy and sequential growth of GSCCI picking up



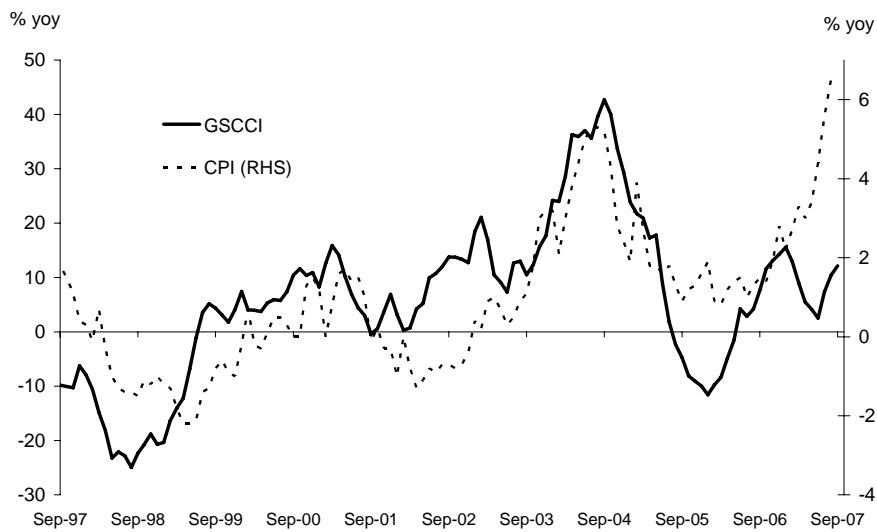
Source: China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

Exhibit 5: GSCCI leads the PPI by around two months



Source: China Coal Information Center, Mysteel, CEIC, Goldman Sachs Economics Research.

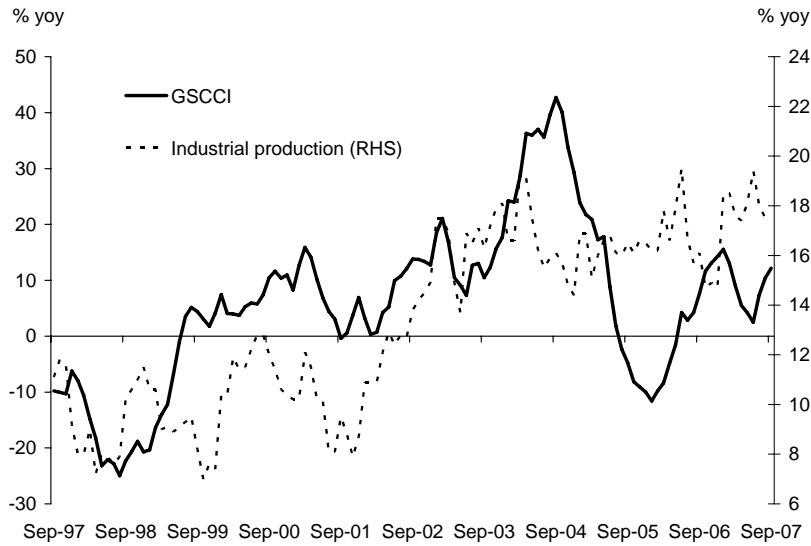
Exhibit 6: GSCCI tends to lead the CPI by around two months as well



Source: China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

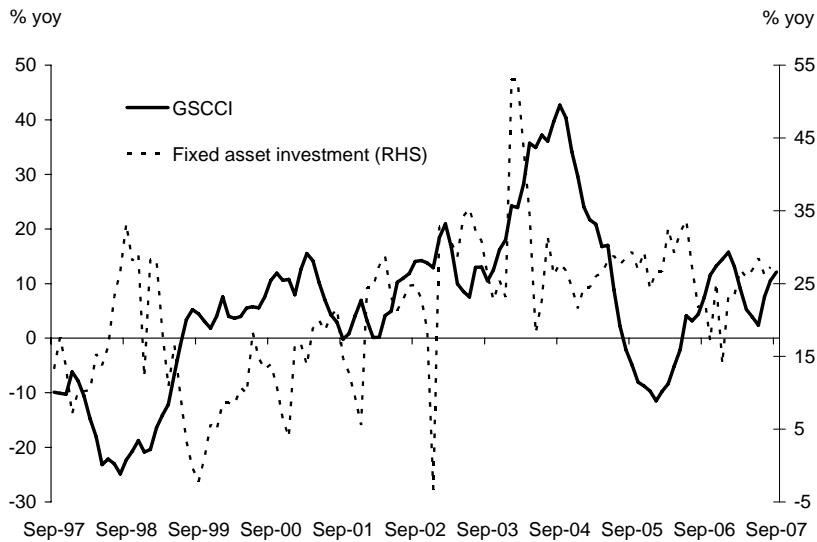
The strength of the GSCCI reflects the strong underlying activity momentum. Since movements in the GSCCI are affected significantly by investment demand and industrial production, it is not surprising to see that changes in the GSCCI tends to move in the same direction as the growth rates of fixed asset investment and industrial production (see Exhibits 7 and 8). The relationship seems to be particularly tight for the GSCCI and the industrial production.

Exhibit 7: GSCCI and industrial production growth tend to coincide with each other



Source: China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

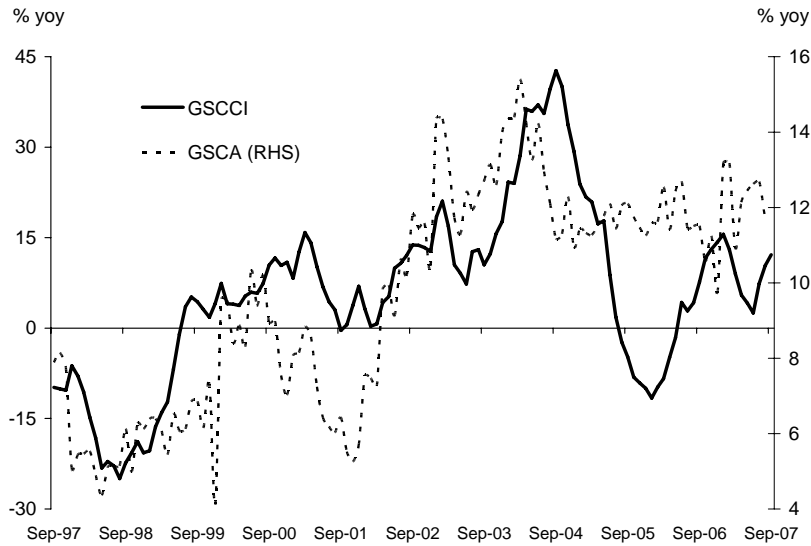
Exhibit 8: Fixed asset investment vs. the GSCCI



Source: China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

Because of data quality issues, we prefer to use the Goldman Sachs China Activity Index (GSCA) as a more reliable and comprehensive activity indicator for China (see Exhibit 9). Here, we again observe a fairly tight contemporaneous correlation.

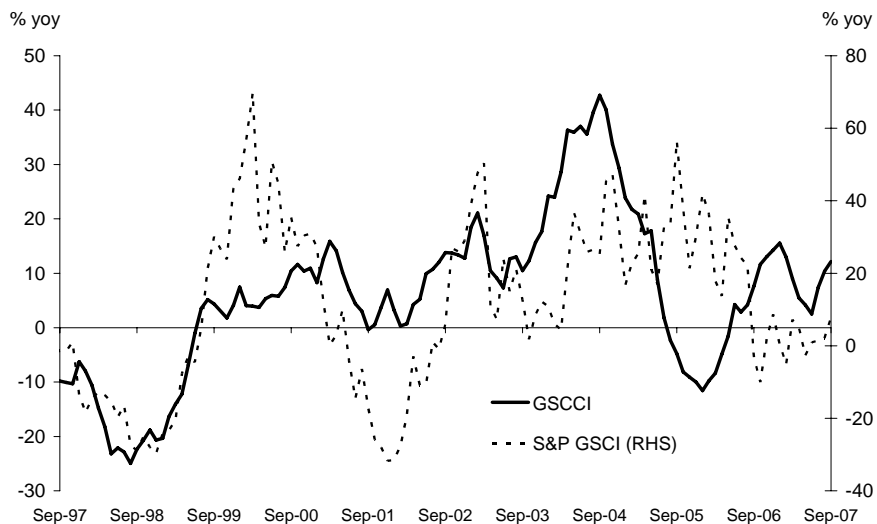
Exhibit 9: The GSCA and the GSCCI



Source: DataStream, China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

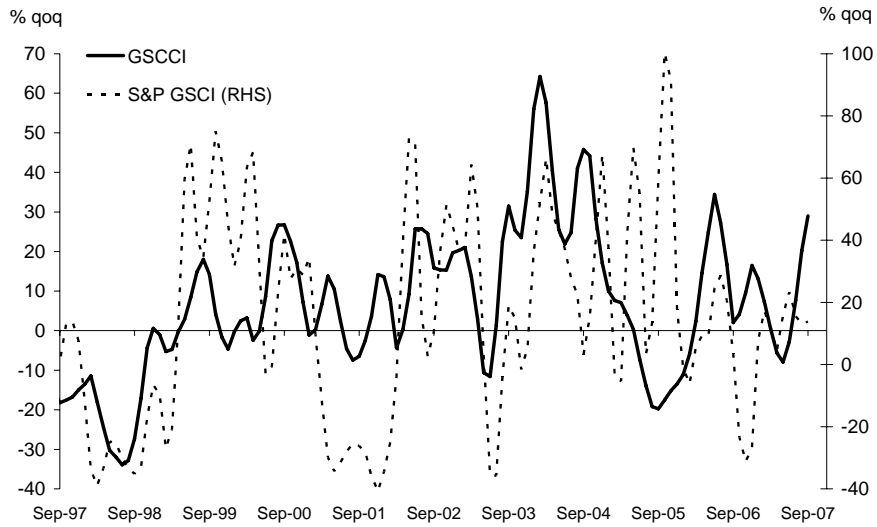
Compared with our global commodity price index, the China Commodity Index seems to track China’s domestic economic cycles better. Yoy growth of the China Commodity Index and the S&P GSCI correlated reasonably well until 2H2004. The China Commodity Index decelerated on the back of the tightening measures implemented in early 2004 but global commodity prices did not soften until 2H2005 (see Exhibit 10). China’s commodity prices subsequently had another mini-cycle between late 2005 and the present, while global commodity price increases have largely been flat to down since 2006. The differences in where the sequential momentum turned are even more striking. The sequential growth rate in the China Commodity Index decelerated earlier in 2004 compared with the S&P GSCI, and it has shown a clear pickup in recent months (see Exhibit 11).

Exhibit 10: Yoy readings of the GSCCI reflect domestic economic conditions better...



Source: DataStream, China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

Exhibit 11: ...the difference is even starker with sequential data

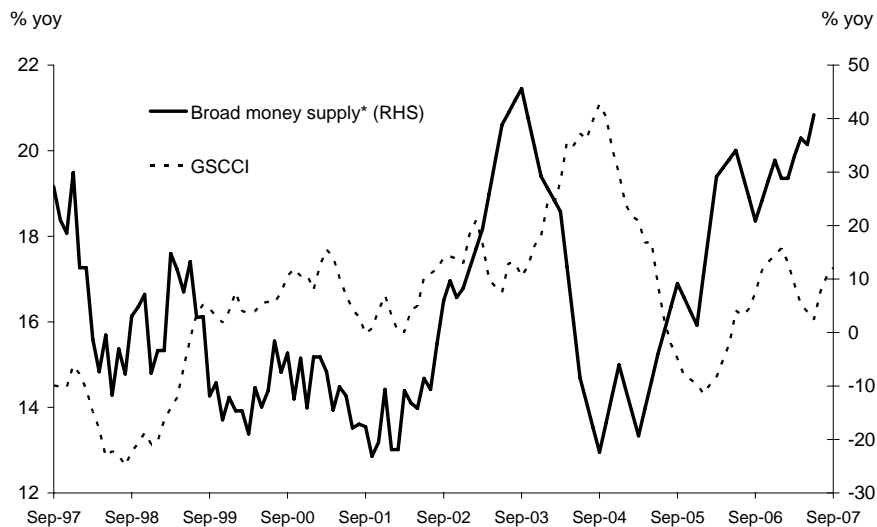


Source: DataStream, China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

What drives the GSCCI?

Since the GSCCI is more correlated with China’s own demand swings, it is not surprising to find that changes in China’s money supply seem to play a bigger role in driving the fluctuations in the China Commodity Index. An expansion of money supply tends to be followed by acceleration in real economic activity, leading to upward pressures in commodity prices in China. We find broad money supply tends to lead the GSCCI by eleven months (see Exhibit 12). Therefore, fast monetary expansion this year will likely lead to a more notable acceleration in the GSCCI going forward.

Exhibit 12: Broad money supply tends to lead the GSCCI



* Broad money supply only contains M2 before 2003. We used a "M3 proxy" for broad money supply after 2003. The M3 proxy includes net foreign assets and domestic credits.

Source: China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, CEIC, Goldman Sachs Economics Research.

Summary

The GSCCI provides a weekly indicator of upstream inflation in China. We hope this index can provide investors with a more timely reading of China’s domestic economic strength than the monthly official data releases. Recent movements in the GSCCI suggest that upstream inflationary pressures are building up, likely reflecting buoyant underlying domestic activity growth. Going forward, the growth trajectory of broad money supply suggests that GSCCI growth is likely to show further acceleration, which we believe will push the level of this index to new historical highs (see Exhibit 13).

Our Commodities Research Team believes coal and steel producers, in particular long products producers, are likely the main beneficiaries of strong domestic demand. Please refer to *China: Steel: Fundamental upside surprise; four mega themes in play*, August 6, 2007, *China: Metals & Mining: Coal: The next leg of the cycle is poised to be big*, July 5, 2007.

Exhibit 13: We expect the GSCCI to reach historical highs



Source: China Coal Information Center, Mysteel, CISA, CRU, Great Wall Futures, Goldman Sachs Economics Research.

Appendix

GSCCI vs. the PPI and CPI

We estimate the relationship between the GSCCI and the PPI using the following equation:

$$(1) sa_ppi = \alpha + @trend(1996m01) + \beta sa_cci(-2) + AR(p) + MA(q)$$

where sa_ppi is the seasonally-adjusted PPI index. The index is a fixed-based index seasonally adjusted using X12.

$@trend(1996m01)$ is a linear function which captures the upward trend of the indices in the regression.

$sa_cci(-2)$ is the lagged seasonally-adjusted GSCCI.

$AR(p)$ is the autoregressive term and $MA(q)$ is the moving average term. These are placed in the equation to capture the persistence of the error terms.

Data used are from January 1997 to August 2007.

Dependent Variable: LOG(SA_PPI)
 Method: Least Squares
 Date: 17/09/07 Time: 00:41
 Sample (adjusted): 1997M01 2007M08
 Included observations: 128 after adjustments
 Convergence achieved after 26 iterations
 Backcast: 1996M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.907001	3.873433	0.750497	0.4544
@TREND(1996M01)	0.007135	0.010830	0.658786	0.5113
LOG(GSCCI_SA(-2))	0.051122	0.018571	2.752737	0.0068
AR(1)	0.992962	0.011723	84.70516	0.0000
MA(1)	0.338195	0.085600	3.950891	0.0001
R-squared	0.996026	Mean dependent var	4.585474	
Adjusted R-squared	0.995897	S.D. dependent var	0.058324	
S.E. of regression	0.003736	Akaike info criterion	-8.303314	
Sum squared resid	0.001717	Schwarz criterion	-8.191907	
Log likelihood	536.4121	F-statistic	7707.007	
Durbin-Watson stat	1.888909	Prob(F-statistic)	0.000000	

The estimator has high explanatory power with an R2 of 99.6%. The coefficient is statistically significant with t statistic of 2.8. The results suggest that the GSCCI leads the PPI by around two months.

Similarly, we estimate the relationship between the GSCCI and the CPI by the following equation:

$$(2) sa_cpi = \alpha + @trend(1996m01) + \beta sa_cci(-2) + AR(p) + MA(q)$$

Dependent Variable: LOG(SA_CPI)

Method: Least Squares

Date: 17/09/07 Time: 18:14

Sample (adjusted): 1997M01 2007M08

Included observations: 128 after adjustments

Convergence achieved after 6 iterations

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	4.446694	0.070265	63.28505	0.0000
@TREND(1996M01)	-0.000439	0.000621	-0.706736	0.4811
LOG(GSCCI_SA(-2))	0.039332	0.015741	2.498707	0.0138
AR(1)	1.031985	0.019422	53.13536	0.0000
R-squared	0.990891	Mean dependent var		4.635633
Adjusted R-squared	0.990671	S.D. dependent var		0.036496
S.E. of regression	0.003525	Akaike info criterion		-8.427087
Sum squared resid	0.001541	Schwarz criterion		-8.337961
Log likelihood	543.3336	F-statistic		4496.366
Durbin-Watson stat	1.863999	Prob(F-statistic)		0.000000

The estimator has high explanatory power with an R2 of 99.1%. The coefficient is statistically significant with t statistic of 2.5. The results suggest that the GSCCI leads CPI by around 2 months.

GSCCI vs. broad money supply

Lastly, we test the effects of broad money supply on the GSCCI with the following equation:

$$(3) sa_gscci = \alpha + @trend(1996m01) + \beta broadmoney(-11) + AR(p) + MA(q)$$

Dependent Variable: LOG(GSCCI_SA)

Method: Least Squares

Date: 18/09/07 Time: 19:06

Sample (adjusted): 2000M01 2007M09

Included observations: 93 after adjustments

Convergence achieved after 9 iterations

Backcast: 1999M12

Variable	Coefficient	Std. Error	t-Statistic	Prob.
C	2.897903	0.548548	5.282860	0.0000
@TREND(1996M01)	0.002709	0.004516	0.599950	0.5501
LOG(BROADMONEY_SA(-11))	0.511632	0.306005	1.671971	0.0981
AR(1)	0.949962	0.034865	27.24693	0.0000
MA(1)	0.324080	0.103682	3.125719	0.0024
R-squared	0.995661	Mean dependent var	4.649158	
Adjusted R-squared	0.995464	S.D. dependent var	0.270804	
S.E. of regression	0.018239	Akaike info criterion	-5.118233	
Sum squared resid	0.029275	Schwarz criterion	-4.982072	
Log likelihood	242.9978	F-statistic	5048.259	
Durbin-Watson stat	1.884911	Prob(F-statistic)	0.000000	

The estimator has high explanatory power with an R2 of 99.5%. The coefficient is statistically significant with t statistic of 1.67. The results suggest that broad money supply leads the GSCCI by around 11 months.

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