An Analysis of Steaming Coal Price Trends

- Factors behind Price Fluctuations and Outlook -

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Introduction

The world's steaming coal imports, 120 million tons in 1980, have grown steadily to 334 million tons in 1998. Japan is the largest importer, responsible for some 20% of the world's steaming coal imports. Among exporters, Australia holds the largest share of the world's steaming coal exports at 25%. On these accounts, to focus on Japan's coal import prices from Australia appears rational in an attempt to analyze steaming coal price trends

This report is designed to analyze what factors are influential on the Australian coal export price, then consider its future price trends.

1. Factors Influential on Australian Steaming Coal Export Prices

1-1 Historical price trends

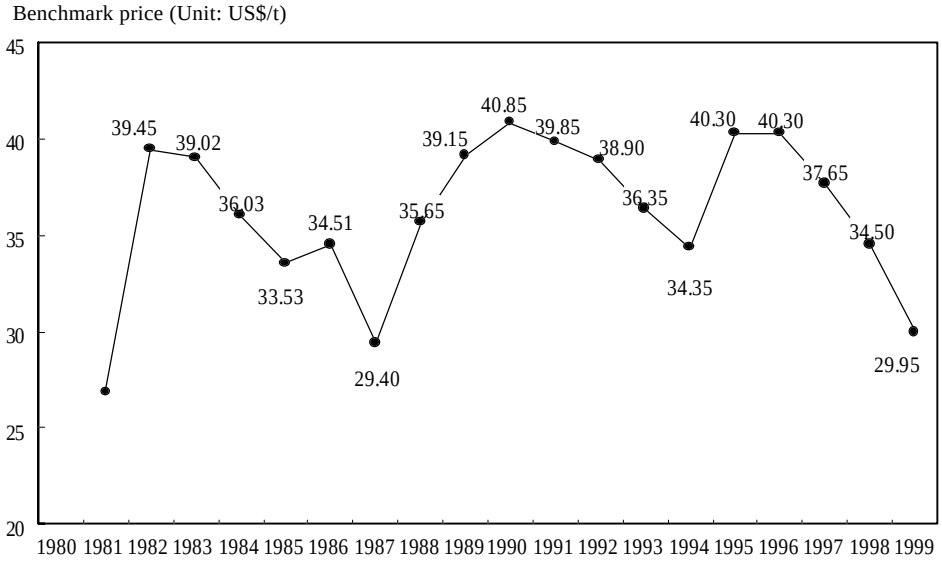
Past records of changing Australian steaming coal prices in FOB benchmark terms (those after 1998 are in reference price terms as discussed later in 1-3) unveil that, since 1982, the prices have shown cyclic fluctuations within the US$29.40 - 40.85/ton range in Fig. 1-1. The price peaks emerged three times, US$39.45/ton in 1982, US$40.85/ton in 1990, and US$40.30/ton in 1995-96, all capped at around US$40/ton. On the other hand, the floor prices, US$29.40/ton in 1987 and US$34.35/ton in 1994, kept declining for three consecutive years since 1997 and stood at US$29.95/ton as of 1999. While many factors are considered interwoven in these price fluctuations, more responsible ones than others are verified in this report. They include (1) exchange rates of the Australian dollar, (2) fluctuations in coal stocks (degree of supply and demand tightness), (3) coal productivity (production cost), (4) the U.S. coal export trends, and (5) the price of oil as a rivaling fuel.

1-2 Impact of the exchange rate

1-2-1 Changing rates of the Australian dollar

The majority of the world's coal trade markets are making transactions in the U.S. currency (US$).

Fig. 1-1 FOB Benchmark Prices for Australian Steaming Coals (1980-99)



(Source) Prepared from "Coal Information," etc.

It means the Australian coal producers have their sales revenues affected considerably by the exchange rate of their local currency, the Australian dollar, against the U.S. dollar. It was in 1982 and 1986, respectively, when the Australian coking and steaming coals first traded in U.S. dollars. Though valued at A$0.99 against the U.S. dollar as of 1982, the Australian dollar later has remained weak as an underlying trend and stood at the first low rate, A$1.50 in 1986 (see Fig. 1-2). After bouncing back a little, Australian dollars marked in 1993 the second low rate, A$1.47, then further hit a record low of A$1.59 in 1998.

Generally the exchange rate is expected to converge into the purchasing power parity in the long run. Yet, what's plotted in Fig. 1-2 suggests that recently the Australian dollar has been much undervalued than its purchasing power parity. Eventually the Australian dollar is expected to get stronger, with such signs already noted since early 1999.

For the Australian coal exporters, a weak Australian dollar promises greater revenues in local currency and, in reverse, a strong Australian dollar lessens their revenues. Hence, it's easy to imagine the formidable magnitude of impacts produced by the Australian dollar's rate on not merely the Australian coal industry's losses and gains but also coal pricing, the latter as a reaction to the former.

1-2-2 Relation of coal price to exchange rate

Plotting the past records of the Australian dollar's rate and those of the FOB benchmark price in a single chart (Fig. 1-3), the two are found correlated after 1987 when steaming coal trade set to grow. Usually decided at the beginning of each year, the benchmark price is strongly correlated to the previous year's exchange rate. When coal is priced cheap, as in 1987 (US$29.40/ton), 1994 (US$34.35/ton) and 1999 (US$29.95/ton), the previous years' Australian dollars were valued as low as A$1.50, A$1.47 and A$1.59, each, against the U.S. dollar. Reversely, a coal price above US$40/ton, as in 1990 and 1995-96, reflected a robust Australian dollar's rate, like A$1.26 and A$1.28, respectively.

Depending on exchange rates, the benchmark prices converted into Australian dollars are often found rising even when they are down in American dollars. Good examples are noted in 1983-1985, 1991-1993 and 1998. In these years, the declines in the benchmark prices were more than offset by exchange gains (from a weak Australian dollar). Reversely, a strong Australian dollar, as in 1987 and 1994, sent the coal prices falling in local currency and caused many mine closures, thus producing a grave negative impact on the Australian coal industry. Interestingly, such bleak years were coupled with sharp price rises in the following years.

1-2-3 Exchange rate and factors of rate fluctuations

Fig. 1-2 shows the Australian dollar has been rising rightward in the long run, though fluctuating sharply midway.

Four factors can be cited as major contributors to the rate fluctuations. They are (1) purchasing power parity, (2) current account balance, (3) interest differentials, and (4) exchange rate forecasting (speculative). Purchasing power parity can be positioned as a long-term equilibrium rate, one of the criteria based on which the market players forecast exchange rates in the long run. The purchasing power parity can be explained by Equation 1-1.

Fig. 1-2 Australian Dollar's Rates

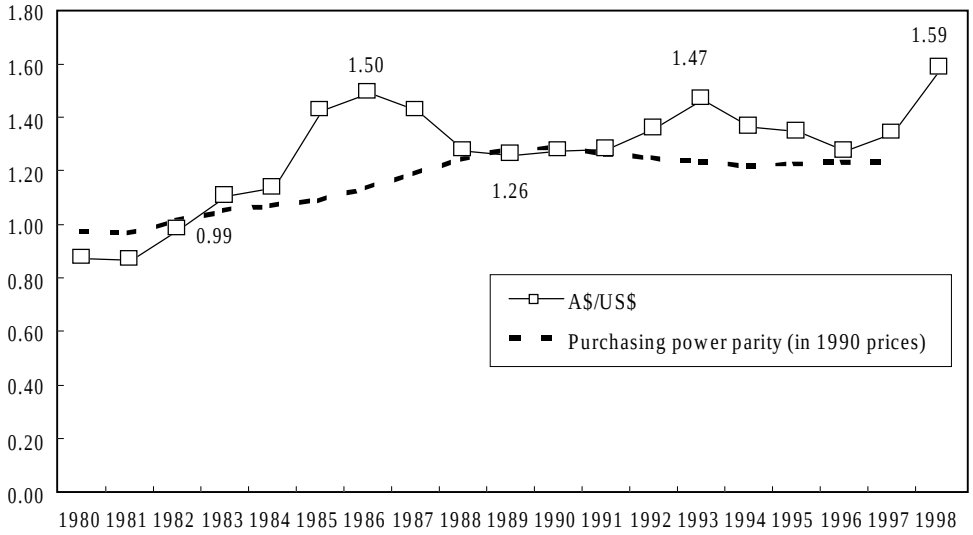
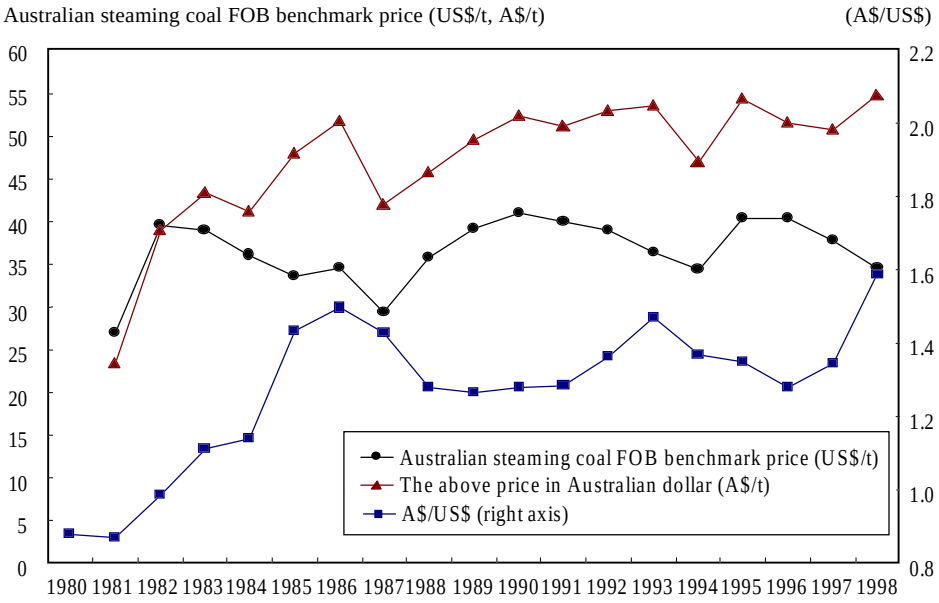


Fig. 1-3 Relation of Coal Price to Exchange Rate



Equation 1-1

Purchasing power parity
= Purchasing power in US$/purchasing power in A$
= Australian commodity price levels/US commodity price levels
= Exchange rate at a reference point * (Australian inflation rate/US inflation rate)
= Exchange rate

The purchasing power parity of Australian dollars against the U.S. dollar depends on the inflation rates in Australia and the U.S. Namely, if the Australian inflation rate stays higher than in the U.S., it produces pressures to weaken the Australian dollar, while a lower inflation rate than in the U.S. strengthens Australian dollars.

Thus, in the long term, the Australian dollar's rate against the U.S. dollar can be governed by the Australian and American inflation rates. Over 1984-1988 (before and after the Plaza accord), the moves of the exchange rate are found decoupling from the purchasing power parity. Perhaps it is because the exchange rate in the short term is governed by, not the inflation-linked purchasing power parity, but the other factors cited above.

Entering the 1990s, Australia's inflation has been lower than in the U.S., which helped its purchasing power parity stay high. Nevertheless, Australian dollars have remained rather undervalued. Though once running strong in 1996, the Australian dollar became weak again later. Particularly in 1998, the Australian dollar, already decoupling from its purchasing power parity, crumbled further due to additional elements, or a combination of low interest rates and excess imports. The current situations contain high potentials toward a strong Australian dollar. Once becoming real, a strong Australian dollar could corner the Australian coal industry. That's why the exchange rate moves should carefully be watched ahead.

1-3 Fluctuations in coal stocks (degree of supply and demand tightness)

To adjust supply and demand gaps by stocks, if any, is the basic principle. In other words, how many coals are stocked represents a degree of coal supply and demand tightness. The stocks are also strongly correlated with the coal price.

Fig. 1-4 illustrates how the Australian exportable coal stocks nationwide are related to the differentials between the benchmark (long-term contract) and spot prices. The greater coal stocks widen the differentials, by sending the spot price down. Reversely, the smaller stocks push the spot price up.

The Australian exportable coal stocks, over 10 million tons in 1998, large enough to produce a sense of gluts, have shrank much to 8.20 million tons by January 1999. Accordingly, the once wobbling spot prices below US$20/ton have disappeared and bounced back to US$24/ton by late February.

After its replacement with the reference price in 1998, the benchmark price carries a unified price-like character less than ever. Yet, it still plays a key role as a price indicator. Fig. 1-5 illustrates how the spot and benchmark prices are related. It is noted clearly that the spot price goes first and is followed

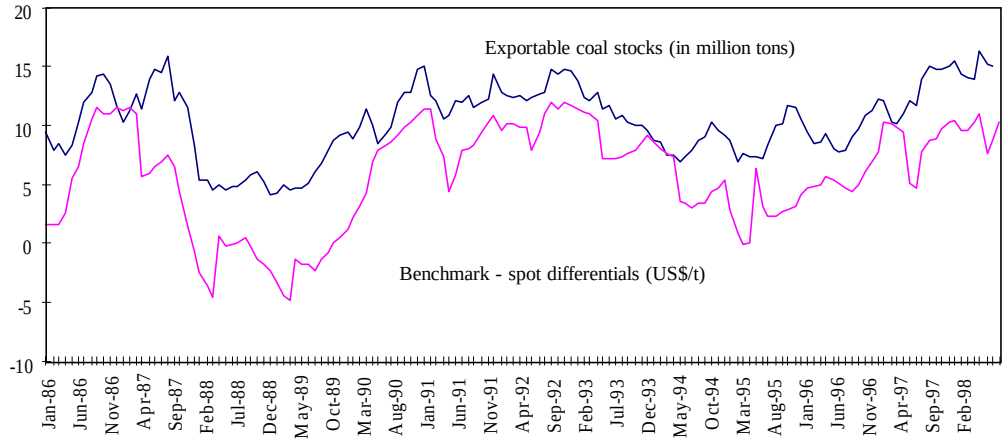
by the benchmark price. That's why the previous spot price moves have a great impact on revising the reference price each year. In this connection, given their strong link to the spot prices, the trends of coal stocks need to be scrutinized as well.

1-4 Impact of coal productivity (production cost)

Fig. 1-6 shows that, in local currency in real terms, the Australian coals' average FOB price (of actual records unlike the benchmark price case) has been on the gradual decline (falling rightward) since 1990. In principle, the commodity prices set to fall along with improving productivity. Coal productivity in Australia nationwide has actually increased (rising rightward) in reverse to the downward price, faithful to the principle. In this chart, real coal prices ceased to fall in 1995-1996, during which coal productivity did not increase. Thus, coal productivity is closely correlated to the coal price.

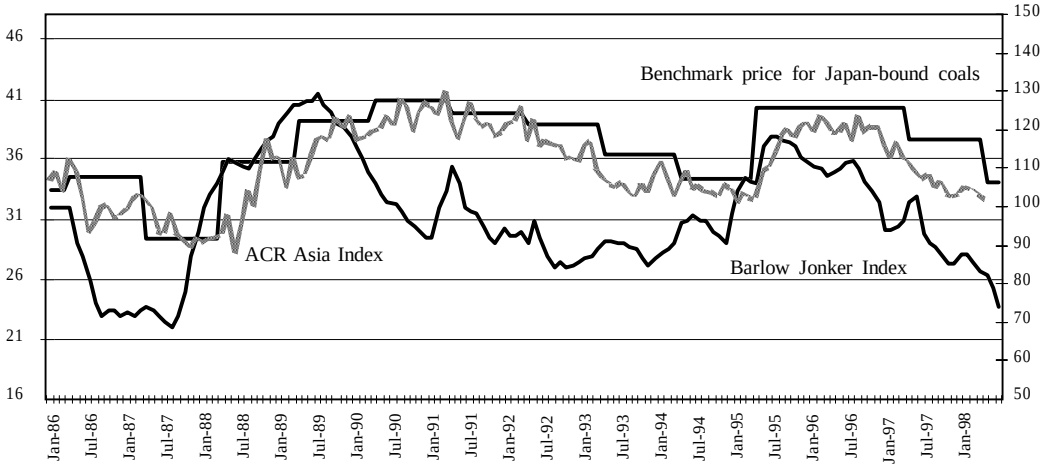
To increase profitability naturally requires coal producers to endeavor for productivity improvement. Ironically, however, their successful efforts lead to trimming the price. Producers failing to improve productivity are forced to leave the market (by closing their mines), and this selection of mines also contributes to raising productivity higher industry-wide. It is just the sort of price falls triggered by the market principle that demonstrates the general rule; the commodity prices set to fall along with productivity improvement. Though applicable to ordinary times, this basic rule does not work in emergencies, like souring Mideast situations and a nuclear accident, which can overheat coal demand and tighten supply and demand. A good example is the so-called coal fever during the second oil crisis, when overheated coal demand jerked the coal price up steeply to extremes. In addition, there is a long-range concern that depletion of coal resources can worsen siting

Fig. 1-4 Decoupling of Wider Coal Differentials (Contract vs. Spot) and Stock Levels



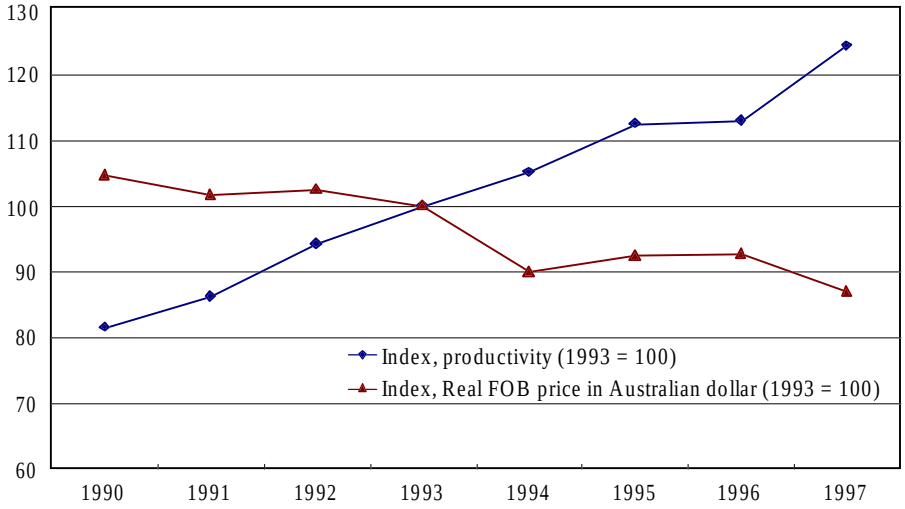
(Source) Barlow Jonker, "Australian Coal Report"

Fig. 1-5 Relation of Spot Price to Benchmark Price



(Source) Barlow Jonker, "Australian Coal Report"

Fig. 1-6 Relation of Coal Price to Coal Productivity



(Source) Prepared from "Coal Information 1997."

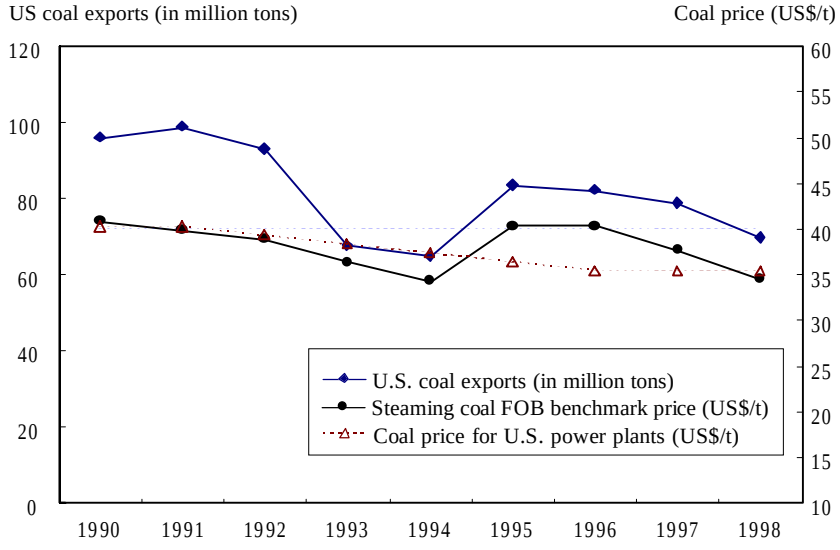
and mining conditions, which, in turn, can send the coal price rising. Though few signs of such depletion are noted for the present, emergencies are often unforeseeable. In this context, it should be kept in mind that the coal price should not always drop hand in hand with improving productivity.

1-5 Impact of the U.S. coal export trends

The U.S., the world's second largest coal exporter after Australia, can have a massive impact on the world's coal trade. Yet, the U.S. exports only about 10% of its coal production and consumes most of the domestic output at home. The market price of American coals naturally depends on its domestic demand, largely bound for electricity generation, and has been on the constant gradual decline (Fig. 1-7).

Fig. 1-7 obviously shows that the U.S. coal exports have fluctuated together with the benchmark price fluctuations. Also, as already discussed, the U.S. export trends appear responsible for capping the past benchmark prices at US$40/ton. Namely, when the benchmark price approaches US$40/ton, as in 1991-1992 and 1994-1996, the U.S. coal exports set to grow. This increases exported coal supplies and slackens supply and demand, thus curbing the pressures to send the benchmark price upward. Reversely, as in 1993 and 1997, the U.S. coal exports tend to plunge extremely low when the benchmark price falls below US$37/ton.

Fig. 1-7 Relation of Coal Price to U.S. Coal Exports



(Source) Prepared from "Coal Information 1997."

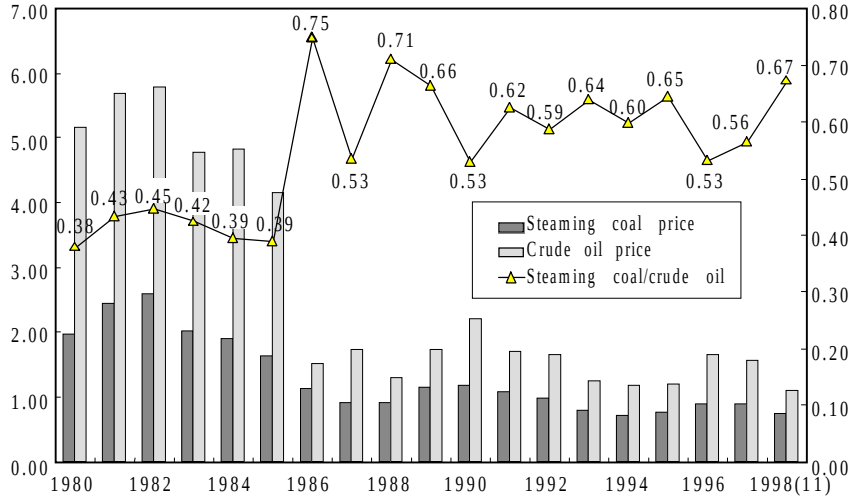
1-6 Impact of oil prices

In Japan too, steaming coal demand revived upon the energy price surges during the two oil crises. The primary factor having spurred the revival was that coal was priced much cheaper than the-then skyrocketing oil and gas prices. Then, such demerits as handling difficulties and environmental load, if taken into account, can undermine utility of coal unless it should be priced cheap, the greatest merit. In short, the oil price sets the ceiling of coal prices.

In equivalent heat value (1,000 kcal), the CIF price of coal in Japan fluctuated toward the same directions as that of crude oil did, though always remaining cheaper than crude oil. Also, given the range of its fluctuations, the coal price has remained rather stable (Fig. 1-8). Particularly in the first half of the 1980s, coal has demonstrated an outstanding price advantage over crude oil. Namely, the price ratio of steaming coal to crude oil has been as small as staying within the 0.38 - 0.45 range. Reversely, the price ratio jumped to 0.75 in the cheap oil price hit year of 1986, then stayed within the 0.53 - 0.71 range afterward. In the pre-1985 days, oil-to-coal fuel switching has formed big streams among coal consumers. But, entering 1986, the streams got stagnated, even reversing to coal-to-oil switching in some cases. For these reasons, the ceiling of coal prices can be put at around 75% of the crude oil price in equivalent heat

Fig. 1-8 Crude Oil and Coal Prices, CIF in Japan

(Unit: ¥/1,000 kcal)



(Source) Prepared from the Ministry of Finance, "Japanese Trade Monthly Statistics."

Table 1-1 Factors of Coal Price Fluctuations and Outcomes

Factors	Direction of changing factors	Resultant price moves
Exchange rate of Australian dollar	A weaker Australian dollar	Down
	A stronger Australian dollar	Up
Exportable coal stocks	Growing stocks	Down
	Shrinking stocks	Up
Productivity	Higher productivity	Down
	Deteriorating productivity: Mines with poorer productivity are urged to leave the market, which also leads to raising productivity industry-wide, thus quite likely to form downward pressures on the price.	Down
U.S. coal exports	Larger U.S. exports	Down Ceiling price: US$40/ton)
Oil price	Falling oil prices	Down Ceiling price ratio: 75%
Emergencies	Tightened coal supply and demand by souring Mideast situations, a nuclear accident, etc.	Up
Depletion of resources	Rising cost due to worsening siting and mining conditions as a long-term concern	Up

value.

Table 1-1 contains a summary of how the Australian coal price is affected by fluctuations in major influential factors on the price (Australian dollars' rate, coal stocks, coal productivity, American coal exports, oil prices) verified above.

On top of the situations in coal producing and consuming countries, to grasp how each of the factors listed in Table 1-1 is moving is essential in foreseeing the future of steaming coal export prices.

2. Outlook for the Australian Coal Export Price

The preceding chapter presents an analysis of major factors very influential on the Australian coal export price; the Australian dollar's rate, fluctuations in the coal stocks (degree of supply and demand tightness), coal productivity (production cost), the U.S. coal export trends, and the price of oil as an rivaling fuel. Here, by assuming likely trends for each of the five factors, the future the Australian coal export price is figured out.

2-1 Exchange rate of Australian dollars

As shown in Fig. 1-2, the Australian dollar has wobbled since 1996 and marked a record low of A$1.59 against the U.S. dollar in 1998. Moreover, decoupling from the purchasing power parity (US$1 = A$1.23) has become conspicuous ever. This means ever-growing potentials toward a strong Australian dollar. Such signs are already seen in the 1998 monthly records of the Australian dollar's rate. After a peak (US$1 = A$1.70) in August, the Australian dollar has gradually mounted a strong run against the U.S. dollar and reached A$1.56 in February 1999.

On these accounts, the Australian dollar's rate was assumed to fluctuate within the range equivalent to the 1998 average (US$1 = A$1.59) at lowest and to the purchasing power parity of 1997 (US$1 = A$1.23) at highest.

2-2 Fluctuations in coal stocks (degree of supply and demand tightness)

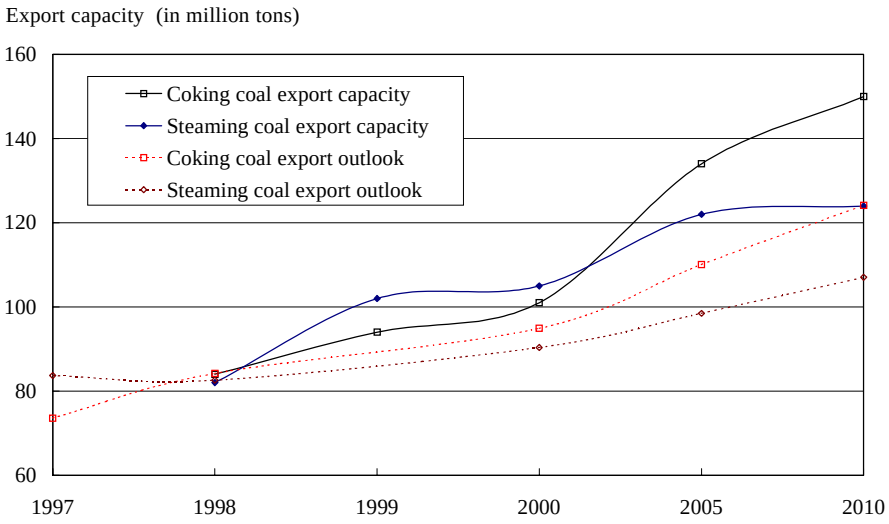
It was already discussed that coal stock fluctuations had a grave impact on the spot price fluctuations, and that the spot price led the contract price (in either benchmark or reference price terms).

Given the degree of supply and demand tightness in the long term, Australia's coal export capacity is much greater than the export projections for its coking and steaming coals alike (see Fig. 2-1). It means Australia's supply capacity should remain sufficient without an abrupt and considerable surge in coal demand.

2-3 Coal productivity (production cost)

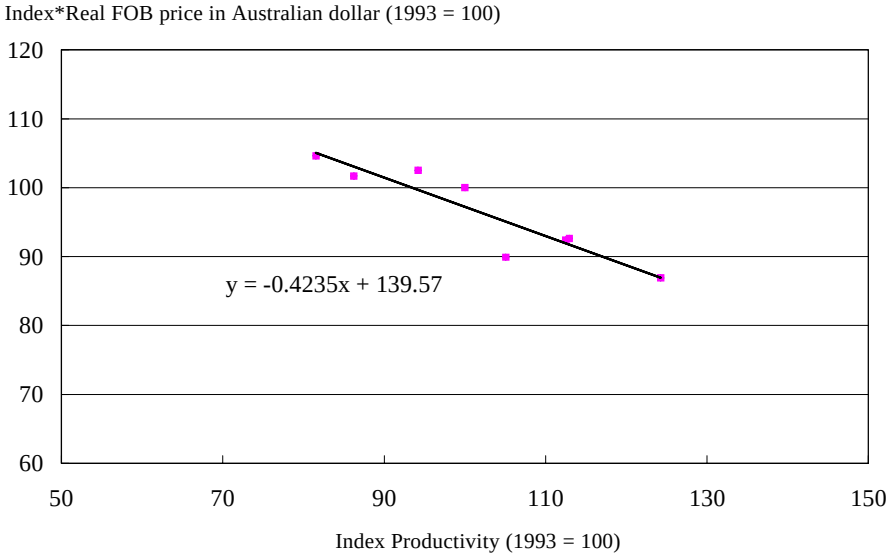
In the U.S. coal industry, exposed to fiercer competition than its Australian counterpart, coal productivity has increased by 6.9%/year on average since 1980 to 1997. In absolute terms, all-U.S. productivity was 5.48 tons/man/hour in 1997, higher than all-Australia records of 4.41 tons/man/hour in that year. Because the U.S. figure of 4.41 tons was achieved in 1993-94, the Australian mines are considered 3-4 years behind their U.S. counterparts in coal productivity.

Fig. 2-1 Australian Coal Export Capacity and Outlook



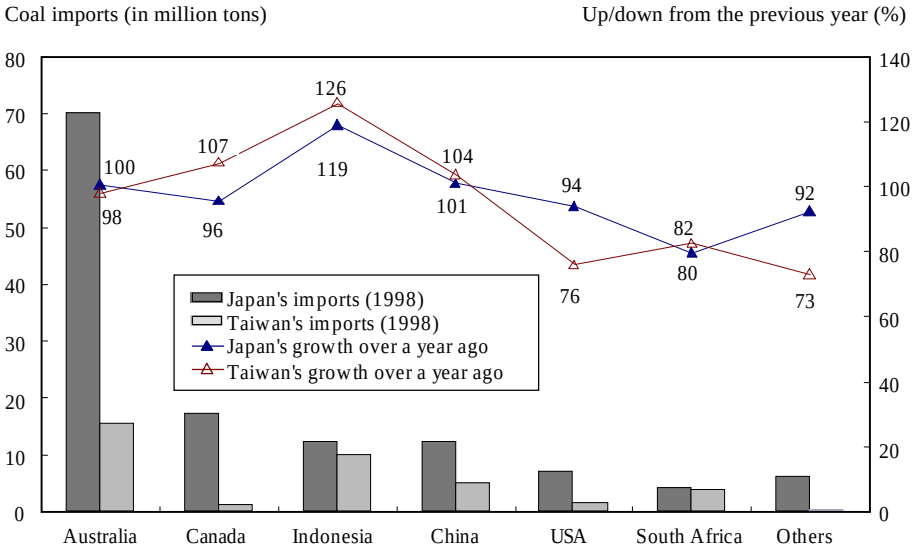
(Source) Prepared by IEEJ from J. Barlow and "Coal Information 1999."

Fig. 2-2 Coal Price Elasticity to Coal Productivity (1990 - 1997)



(Source) Prepared from "Coal Information 1997."

Fig. 2-3 Japanese and Taiwanese Coal Imports and Growth (1998)



(Source) Prepared from "Coal News" and "TEX Report."

Given the U.S. experience, all-Australia coal productivity, up 6.6%/year in 1988-97, is very likely to keep increasing at that pace. Elasticity of the coal price (in real Australian dollar terms) to coal productivity will be -0.42 as shown in Fig. 2-2. Accordingly, if productivity continues to increase by 6.6%/year, the coal price should be undercut by 2.77% (= 6.6%/year * -0.42) in real Australian dollar terms.

2-4 Export trends of American and Indonesian coals

As already discussed, the U.S. coal exports function as a swing supplier in coal trade. Namely, the U.S. coal exports set to boost when its export price reaches the latter half of the US$30/ton level, then consequently cap the coal export price at about US$40/ton. As shown in Fig. 1-7, the U.S. electricity prices have been falling year after year in reflection to ever-increasing coal productivity. This move can precipitate the formation of export incentives, that is, there is a possibility of larger U.S. coal exports when the export price outruns the domestic coal price. Hence, the upper-limit (ceiling) price governed by the U.S. coal exports is very likely to go down in parallel with the U.S. domestic coal price.

Indonesia exports less coals than the U.S. does in total volume, but its coal shipments to Asia

amounted to 29 million tons (1997), nearly double the U.S. coal exports to that area. The Indonesian coal exports are growing at a high pitch as well. Therefore, carrying the same nature as the U.S. coals, the Indonesian coals challenge the Australian coals, though at a different degree of magnitude. Fig. 2-3 shows the Japanese and Taiwanese coal imports in 1998 by exporting country. Protrusion of Indonesian coals is obvious.

Taiwan's coal imports from Indonesia grew high probably because Taiwanese Electric Power, the largest coal consumer in Taiwan, procured a large amount of cheaper-priced Indonesian coals on the spot market through competitive bidding, etc. While Indonesian coals kept winning contracts particularly when the spot prices remained low, the falling value of the Rupiah, the Indonesian currency, surely helps increase price competitiveness of the Indonesian coals. For these reasons, the Indonesian coals appear to producing not a little impact on the Australian coal price.

From the longer viewpoint, however, the Indonesian coal exports are predicted to reach a peak in 2005, then diminish in order to meet mounting coal demand at home. Therefore, the downward pressures raised by the Indonesian coals on the coal export price can be lessened in the long run.

2-5 Oil prices

The U.S. Department of Energy (DOE, EIA) puts, in the reference case of its oil price outlook, that the oil price will bottom out at US$13.97/bbl in 2000, then keep rising by about 1%/year afterward (Fig. 2-4). If so, the oil-linked ceiling of coal prices is likely to go up along with the rising oil price. It means the oil price would little produce downward pressures on the coal price. Yet, the EIA projects the crude oil price in 2000 at US$10.25/bbl (in 1997 price) in the low price case. Then, assuming the ceiling of coal prices at 75% of the projected crude oil price, coals would be priced at US$29.42/ton in nominal terms, even lower than the present price levels.

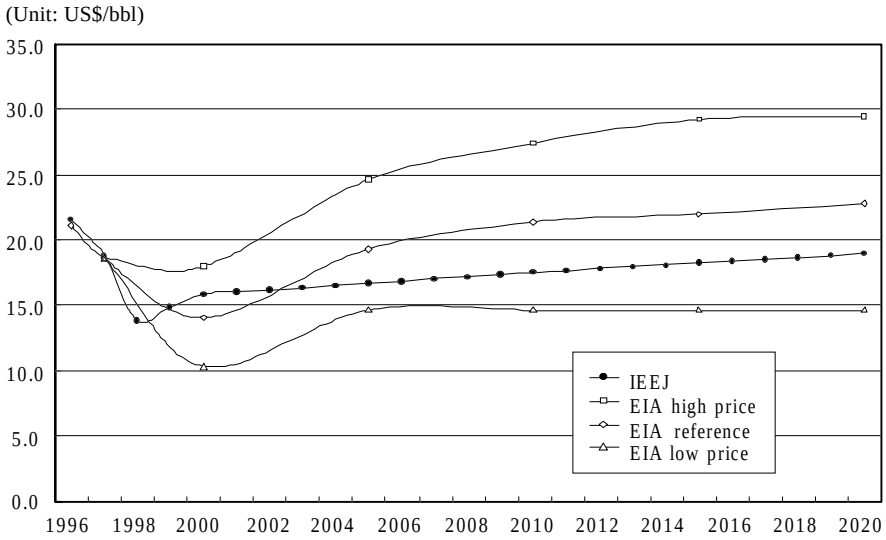
2-6 Coal export price outlook

Among the influential factors on the coal price, of which trends and impacts have been considered so far, it is the exchange rate of the Australian dollar and coal productivity that appear to have the stronger direct control power on the future coal prices. So, the author dared to forecast the coal price by focusing on likely impacts of the two factors. The outcome is plotted in Fig. 2-5. Specific procedures of forecasting are outlined below.

Taken as the starting point of the price was the reference price of 1999, or US$29.95/ton. The floor price was assumed at a record low of the Australian dollar's value (1998, US$1 = A$1.59). The ceiling price was put at the Australian dollar's purchasing power parity (1997, US$1 = A$1.23). The gradient of the straight line that shows the ceiling and floor prices depended on price elasticity (= 0.42) to productivity improvement (= 6.6% recorded in 1988-1997) as well as deflator (= 1.83% marked in 1990-1997).

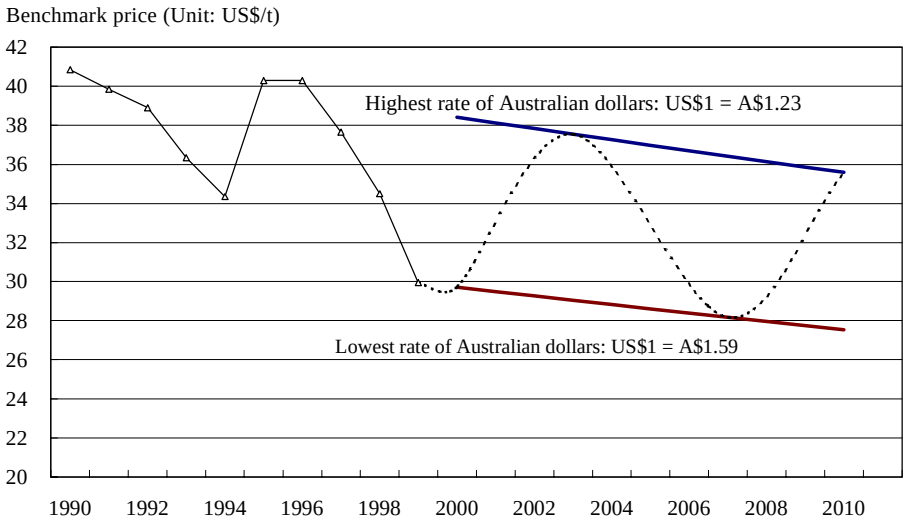
From now on, the coal price is likely to keep fluctuating cyclically within the range enclosed by the dashed line in Fig. 2-5. The direction and the band of its fluctuations are likely to depend on the balance of upward and downward pressures on the

Fig. 2-4 Oil Price Outlook (in 1997 prices)



(Source) US EIA, "Annual Energy Outlook 1999" and IEEJ reference materials

Fig. 2-5 Australian Coal Export Price Outlook



coal price. Based on Table 1-1, upward and downward pressures on the coal price were organized again. A summary is given below.

(Upward pressures)

* A stronger Australian dollar
* Shrinking exportable coal stocks
* Occurrence of emergencies (tightened coal supply and demand triggered by souring Mideast situations, a nuclear accident, etc.)
* Depletion of resources (worsening siting and mining conditions can increase the cost as a long-term concern)

(Downward pressures)

* A weaker Australian dollar
* Growing exportable coal stocks
* Higher coal productivity
* Increasing U.S. coal exports
* Falling oil prices

Acknowledgements

This paper was prepared by partially revising an IEEJ report on steaming coal price outlook, drafted under a FY1998 study project sponsored by the New Energy and Industrial Development Organization (NEDO) to learn what infrastructure would be needed for spurring overseas coal imports.

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