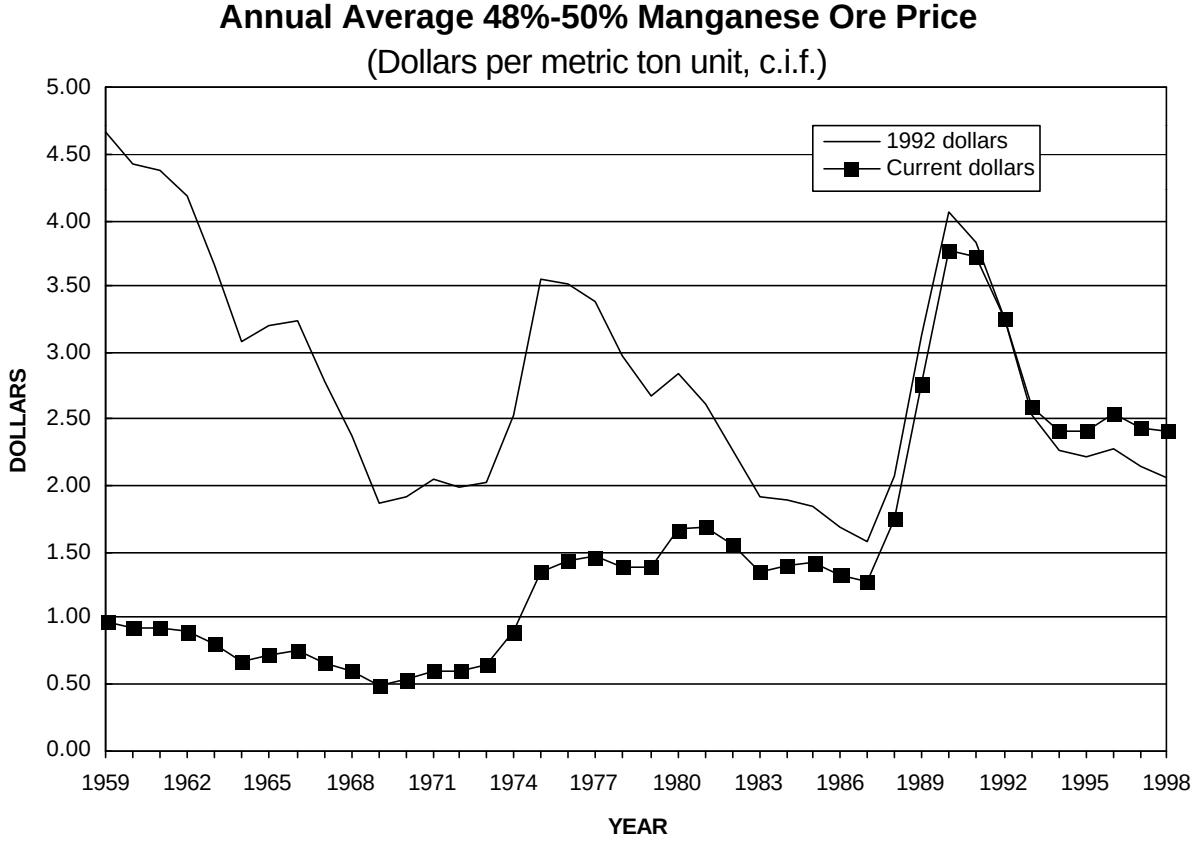
Manganese

by Thomas S. Jones



Significant events affecting manganese ore prices since 1958

1960's	Production begins from the Groote Eylandt deposit in Australia and Moanda deposit in Gabon and potential of deposits in South Africa's Kalahari Field begins to be recognized
1965-78	Releases of stockpile excesses
1973-74	High levels of steel production
1974, 1978, 1981	Sharp increases in oil price
Early 1980's	Economic recession, strong U.S. dollar
1980's	Adoption of steelmaking technology that significantly reduces amount of manganese required per ton of steel produced
1983-90	Significant imports of high-grade ore by China and the Soviet Union
1991	Dissolution of the Soviet Union

This discussion of manganese price is based on the price of manganese units in metallurgical-grade ore, for which a lengthy history exists. Manganese is used mostly in the production of iron and steel. Manganese metal, a minor component of overall manganese demand, is a brittle substance that has little use except as an alloying element. The most important metallic materials containing manganese are the manganese ferroalloys, of which high-carbon ferromanganese and silicomanganese have the greatest uses. The value of manganese in upgraded forms reflects the extraction cost so that for materials used in the United States in 1997, the ratio of price per manganese unit as contained in

upgraded form versus that in ore was 2.5:1 for high-carbon ferromanganese, 2.6:1 for silicomanganese, and 10:1 for manganese metal (Jones, 1998). Price trends for these materials do not necessarily parallel those for ore because of differences in such factors as world structure and number of suppliers and also because most ore usage is by way of ferroalloy smelters.

No central exchange has existed for setting the price of manganese ore. Rather, prices have been established by negotiation between buyers and sellers, taking into account such factors as content of elements other than manganese, physical character, quantity, and, of considerable significance, ocean freight rates. Trade journals have published prices reflecting their sense of the market. These journals mainly list the price for metallurgical-grade ore; price listings for ore used in battery and so-called chemical applications are fragmentary or nonexistent. The benchmark price for metallurgical-grade ore is for relatively high-grade ore with a manganese content in the range of 48% to 50%. Prices stated herein for metallurgical-grade ore generally meet that standard, although this may not be strictly true throughout the entire time interval tabulated, particularly when the countries that are dominant sources of ore change.

The unit pricing system is used with manganese ore to accommodate variations in manganese content. For some years now, the metric ton unit has been used; formerly, pricing had been based on the long ton unit. A unit is 1/100, or 1%, of the weight unit, so that 1 metric ton unit corresponds to 0.01 metric ton, or 10 kilograms, of manganese. To obtain the price of a metric ton of ore, the metric ton unit price is multiplied by the percent manganese content of the ore. For example, an ore priced at $2 per metric ton unit that contains 50% manganese would have a value of $2 x 50 = $100 per ton. At the price level of $2 per 10 kilograms of manganese, the value of the manganese content of the ore also could be expressed as 20 cents per kilogram of manganese-in-ore.

The larger year-to-year users of manganese ore have tended to make their purchases by means of annual contracts, which have been much more important than spot contracts. The U.S. market was once the largest for manganese ore so that prices tended to be set in the latter part of the calendar year for the next year's shipments. With the decline in smelting of manganese ferroalloys in the United States, however, the Japanese have been the key factor in setting annual prices for a number of years. The timing of price negotiations has tended to revolve around the Japanese fiscal year, which begins on April 1. After the price to Japanese consumers is set at about that time, settlements on a similar basis usually follow elsewhere (Carmichael, 1992).

Between 1959 and 1998, manganese ore price exhibited peaks in 1981 and 1990 and valleys in 1969, 1987, and 1994-95. The average annual rate of advance in price throughout these four decades has been about 4.8%; since the late 1960's, ore price has advanced at a 6.7% annual rate. These rates of advance might be compared with those for the Consumer Price Index (CPI), which grew at an annual rate of 5.3% during this time period. The CPI grew at an annual rate of 8.6% during the 1970's, but since the early 1980's, it has been advancing at an annual rate of only 3.6%.

The downward trend in ore price between 1959 and 1969 was a continuation of a recession from a then-record high price in 1957. This was about the time that the Suez Canal was closed briefly and that shipments began from the Amapá deposit in Brazil, an important new source of manganese. Between 1951 and 1959, the U.S. Government had stockpiled manganese ore from foreign and domestic sources. Beginning in the mid-1960's, however, the Government sold sizable quantities of excess ore so that the stockpile effectively became a medium-size "mine." Stocks of metallurgical-grade ore that had been more than 9 million tons in 1969 were reduced to less than 4 million tons by 1978 (DeHuff, 1971, 1980). Also in the 1960's, development of several significant mostly new manganese deposits contributed to declining ore prices and alteration of the international supply pattern for manganese ore. Two of these were the Groote Eylandt deposit in Australia's Northern Territory and the Moanda deposit in Gabon, both of which were developed into large surface mines (DeYoung, Sutphin, and Cannon, 1984). During the 1960's and 1970's, several major mines based on the enormous manganese deposits of the Kalahari Field in South Africa's Northern Cape Province were opened, typified in the north by the Black Rock Mine and in the south by the Mamatwan Mine (Coffman and Palencia, 1984).

The declining trend of ore price in the 1960's was replaced by an even steeper upward trend in the 1970's. The low of $0.49 per metric ton unit in 1969 was followed by prices of about $1.40 per metric ton unit between 1975 and 1979. Contributing factors were the comparatively high rates of domestic and international steel production, especially in 1973-74, and the shock effects of oil price increases between 1974 and 1981.

After an ore price of nearly $1.70 was attained in 1980-81, the direction of the trend again reversed in 1982 with onset of a worldwide recession. In the early 1980's, the more-efficient use of manganese in steelmaking depressed demand for manganese. For example, by changing the way in which pig iron was converted into steel, domestic steelmakers reduced their unit consumption of manganese in steelmaking by about one-fifth within about 2 years. This reduction was much larger than the steel-related growth in manganese demand that otherwise would have been expected, ordinarily about 1% per year. The U.S. ore price in the early 1980's was also depressed by the relative strength of the dollar in relation to other currencies.

After having decreased to $1.27 per metric ton unit as of 1987, ore price rose sharply to three consecutive all-time record highs in terms of current dollars between 1988 and 1990, concurrent with recovery of domestic and world steel production. Prior to the recovery in steel production, the

nature of the international manganese ore market was changed when the then-U.S.S.R. and China began importing substantial quantities of ore in 1983 and 1984, respectively. The imports were from such countries as Australia, Brazil, and Gabon, whose traditional principal export markets were Japan, Western Europe, and the United States. With so few competitors on the supply side, the market constituted an oligopoly. An apparent shortage of high-grade ore that developed because of unusually large ore purchases led to a price of $3.78 per metric ton unit in 1990, the record high to the present.

Prices generally have receded since the 1990 peak. One of the main reasons was dissolution of the former U.S.S.R. in 1991 and the subsequent contraction of industrial production in its successor republics; this caused the developing ore market to disappear within a short period of time. Another factor was the reactivation of mining or development at known deposits, as in Western Australia (Chadwick, 1991); this led to modest additions to supply from what might be termed "mini-mines," which nevertheless had a significant impact on price negotiations.

During the 1990's, a continuing trend, often on an international scale, has been the integration of mine production with ferroalloy production, which has the potential to affect the way ore is priced in the future.

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Annual Average 48%-50% Manganese Ore Price[1]

(Dollars per metric ton unit, c.i.f. U.S. ports)[2]

Year	Price	Year	Price	Year	Price	Year	Price
1910	0.26	1933	0.41/0.19	1956	1.49/1.44	1979	1.38
1911	0.26	1934	0.45/0.23	1957	1.61/1.56	1980	1.67
1912	0.25	1935	0.47/0.25	1958	1.25/1.19	1981	1.69
1913	0.25	1936	0.37/0.26	1959	1.02/0.97	1982	1.56
1914	0.26	1937	0.55/0.44	1960	0.98/0.93	1983	1.36
1915	0.31	1938	0.47/0.36	1961	0.98/0.93	1984	1.40
1916	0.49	1939	0.43/0.32	1962	0.95/0.90	1985	1.41
1917	0.96	1940	0.62/0.51	1963	0.85/0.80	1986	1.32
1918	1.25	1941	0.76/0.65	1964	0.71/0.68	1987	1.27
1919	0.65	1942	0.83/0.72	1965	0.72	1988	1.75
1920	0.66	1943	0.83/0.72	1966	0.75	1989	2.76
1921	0.28	1944	0.78/0.67	1967	0.66	1990	3.78
1922	0.31	1945	0.84/0.73	1968	0.59	1991	3.72
1923	0.63/0.41	1946	0.77/0.66	1969	0.49	1992	3.25
1924	0.60/0.38	1947	0.69/0.58	1970	0.53	1993	2.60
1925	0.64/0.42	1948	0.70/0.64	1971	0.59	1994	2.40
1926	0.60/0.38	1949	0.77/0.71	1972	0.59	1995	2.40
1927	0.60/0.38	1950	0.96/0.91	1973	0.64	1996	2.55
1928	0.59/0.37	1951	1.18/1.12	1974	0.89	1997	2.44
1929	0.53/0.31	1952	1.33/1.27	1975	1.36	1998	2.40
1930	0.49/0.27	1953	1.25/1.19	1976	1.43		
1931	0.46/0.24	1954	1.00/0.95	1977	1.46		
1932	0.43/0.21	1955	1.08/1.02	1978	1.38		

[1] Values to the left of the slash include U.S. duty.

[2] C.i.f denotes cost, insurance, and freight.

Note:

1910-37, calculated from U.S. Geological Survey and Bureau of Mines, 1940, Report upon certain deficient strategic minerals: U.S. Geological Survey and Bureau of Mines, p. 8.

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