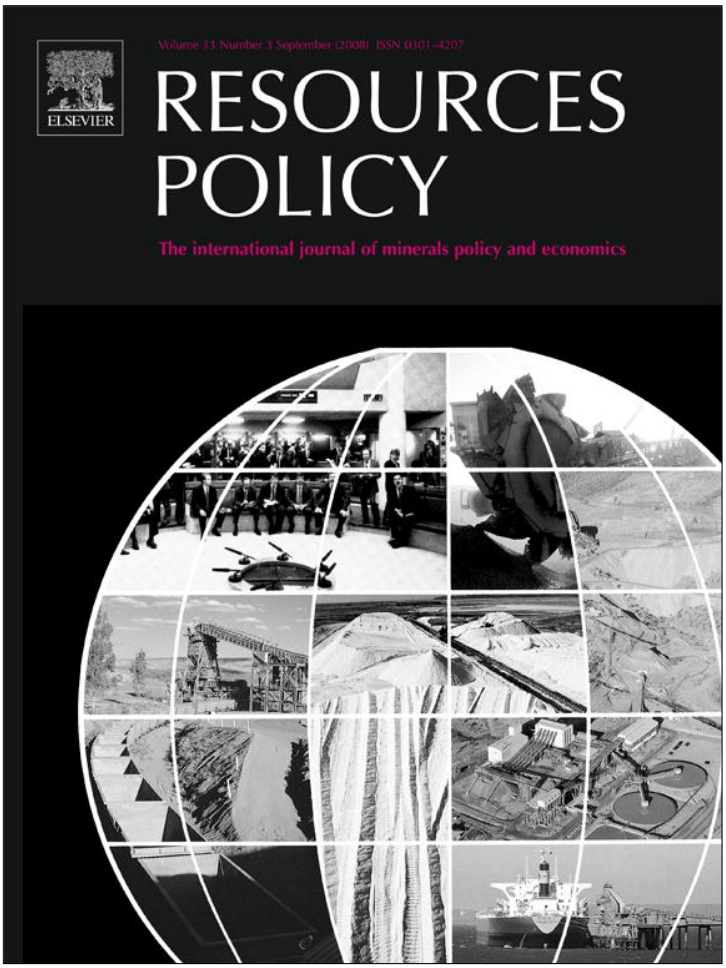

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The boom in mineral markets: How long might it last? ☆

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ABSTRACT

The commodity price boom that emerged in 2004 has proved far more persevering than its predecessors of 1950 and 1973. Some analysts have suggested that it may represent the start of a "supercycle" caused by the voracious raw materials demand from China and other emerging economies, with prices remaining high for 20-30 years. We offer an alternative explanation. For a variety of reasons, the establishment of new capacity in minerals and energy to match the accelerated demand trends is more time consuming than commonly assumed, and may take a decade or longer. As soon as the new capacity is in place, however, the boom will be punctuated. Prices may collapse much earlier in the event of a severe recession that cuts the growth in commodity demand.

In a recent article Radetzki (2006) explains the three post-World War II commodity booms of the early 1950s, the early to middle 1970s, and 2003 onwards, by strong surges in global demand. He finds that the first two booms were of short duration (about 2 years) and ended abruptly because of macroeconomic policies in the major consuming countries undertaken to curb inflation. In both cases these policies turned a rapid global expansion into a worldwide recession, which in turn led to destocking, stagnant or falling commodity demand, and declining prices.

Explaining the current boom

The current boom in commodity markets is different. Like its predecessors, it arose from a demand shock, prompted this time by a combination of unprecedented macroeconomic expansion and high intensities of commodity use in a number of emerging nations, notably China. Its distinguishing feature is its durability: the prices of many mineral materials began their rise already in 2003. In part, the boom owes its longevity to continued strong economic growth: real world GDP expanded by more than 4% each year over the 2004–2007 period, the first 4-year period of such growth since the early 1970s (International Monetary Fund, 2008).

This, however, is not the full explanation. Missing is the reason why high commodity prices and profits over the past half decade have not stimulated the capacity additions needed to allow supply to catch up with demand at prices more in line with production costs. Clearly, in the absence of a broad economic slowdown, commodity booms might well continue for more than one or two years, as expansions to existing installations typically take at least that much time, while 5 years or so are needed to build new greenfield capacity (Tilton, 2006a, b; Radetzki, 2008). However, as the boom enters its 6th year with little sign of abating, many who initially assumed the needed capacity would soon be forthcoming are looking for other explanations.

The major alternative view now emerging among analysts and others is that the present boom reflects the start of a super cycle—the third or fourth such cycle the world has experienced over the past 150 years (Heap, 2005; Cuddington and Jerrett, 2008). For the next 20–30 years or so, according to this view, rapidly growing demand in China and other developing countries will keep commodity prices high, allowing producers to earn excessive profits. As history shows, however, rapidly growing demand does not necessarily produce high and rising commodity prices. For example, the aluminum industry, whose global output rose 40-fold in the 30-year period (1939–1969), experienced at the same time persistently falling real prices (Schmitz, 1979).

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This suggests that a super cycle can only be caused by an *unanticipated shift* from one path of demand growth to a higher one, such as undoubtedly occurred in the early years of the present century. The super cycle thesis also requires some explanation as to why a sector of the economy can earn high profits for a decade or more without attracting the investment and capacity needed to reduce prices and profits.

For this, three possible explanations are suggested: first, it now takes much longer to construct new capacity. Lead times for purchasing new trucks, drills, shovels, tires, mills, and other equipment in the present boom are twice or more those of 5 years ago, while the shortage of mining engineers and other technical people cannot be eliminated quickly. All this is true, suggesting that it will take longer than 5 years, as many have previously thought, to build the needed new capacity. Yet to assume the delays will stretch out over two or three decades seems excessive. Moreover, if the bottlenecks in equipment and trained people are responsible for the delays, the suppliers of these critical inputs are most likely to reap the bulk of any excess profits associated with commodity production, thereby creating incentives to expand capacity in the input industries.

Second, investors as a group may fail to understand the changing world in which they operate and so persistently underestimate needed capacity. As a result, supply continually lags behind the growth in demand. However, this explanation, too, requires a rather strong assumption: namely, that investors fail to adjust their expectations and behavior over a couple of decades despite constant evidence of past errors. It brings to mind similar arguments made less than 10 years ago that for various reasons the mineral sector suffered from an inherent tendency to over invest, keeping returns persistently below levels available in other sectors (Crowson, 2001).

Third, the costs of finding and developing new mineral deposits are rising, requiring in turn ever higher prices to justify investment in new capacity. This increases the value of existing capacity, enhancing the worth of mining firms and the returns to their owners. While it is true that the costs of finding and developing new capacity have increased substantially since the start of the boom, it seems unlikely that this trend will continue over several decades. In fact, a major portion of the recent cost increases is due to rising input prices, which, as noted above, may well be cyclical, and could reverse once the industries that produce these inputs expand their own production facilities.

A simple model

So, neither the traditional nor the super cycle view of the commodity boom seems fully satisfactory. How, then, is one to explain the length and sustainability of the current commodity boom? The simple hypothetical (numerical) model that follows, we believe, provides some useful insights into the extended durability of the ongoing boom and into the mechanics by which it will end. It suggests that, in the absence of a downturn in global economic growth, an investment cycle of more than 5 years though probably less than 15 years is needed to bring markets and prices back to long-run equilibrium.

The model is intended to demonstrate some general features of the investment process in the mineral industries. Circumstances for individual materials are bound to differ, and while the assumed numbers appear to us to be reasonable; they do not attempt to reproduce conditions applying to any specific material.

Our model posits an increase in the secular rate of demand growth and examines how long it takes producers to bring on stream the needed new capacity, under four alternative scenarios reflecting different behavioral responses. Specifically, the calculations shown in the following table assume that

- The growth in demand for a mineral commodity is 2% a year until year 1. In that year, it increases to 5% and remains at this rate. Column b in the table shows the capacity required to meet the demand for years 1 through 14, and so keep the market in equilibrium, on the assumption that required capacity (and demand) in year 0 is 100.
- Five percent of existing capacity has to be replaced each year due to depletion and the depreciation of the capital stock. Consequently, prior to year 1 new capacity must increase by 7% a year (5% to replace the decline in existing capacity and 2% to meet the growth in demand). From year 1 on new capacity must increase by 10% a year to accommodate the faster growth in demand.
- It takes 5 years following an investment decision for new capacity to come on stream.
- The difference between actual and required capacity is the capacity deficit. A capacity deficit causes prices and profits to be higher than in the case where actual capacity equals required capacity.
- The table considers four alternative scenarios, all somewhat mechanical and not fully realistic, but they nevertheless highlight some interesting implications for investment and capacity expansion when demand growth increases.

The first scenario (Table 1(a)), titled "Investments with perfect foresight and prompt elimination of capacity deficit", assumes that producers immediately recognize the new and higher rate of demand growth *and* promptly invest so that the required capacity is in place by year 6. The numbers show that this scenario requires a quadrupling of investment in year 1. Such an increase is implausible in practice, especially since commodity booms typically cause a simultaneous jump in investments for many mineral commodities.

The second scenario (Table 1(b)), "Investment grows at 20% a year" assumes that producers more gradually recognize and adjust to the new, higher rate of demand growth, until the capacity deficit is eliminated. Even with this energetic investment effort, the capacity deficit and high prices endure for 12 years.

The third scenario (Table 1(c)), "Investments grow by 2% in years 1, 2, and 3, and by 30% in subsequent years", tries to take account of the various lags likely to afflict investors in the mineral industries. These include: (a) a "perception lag" or the time it takes for management to fully perceive the new long-run trend; (b) a "decision lag" or the time it takes to get the board together and to persuade it that higher investments are warranted; (c) a "financial lag" or the time it takes to convince the finance community of the appropriateness of the proposed investments and to make the financial resources available; and (d) a "regulatory lag" or the time it takes management to prepare the documentation needed by the authorities, such as environmental assessment reports, and the time the authorities need to issue the necessary permissions. This scenario assumes, perhaps pessimistically, that 3 years will be needed before investments can be boosted, but that then a very impressive investment expansion can be launched. With these assumptions, a capacity deficit and high prices endure for 13 years.

The fourth scenario (Table 1(d)) presumes that "investments grow by 2% in year 1, 30% in year 2, 10% in years 3, 4 and 5, and then by 20% per year". The lag period of continued low investment growth has been shortened to 1 year. It is followed by a strong investment boost in year 2, which is curtailed in years 3, 4, and 5 by shortages of investment inputs. While the industries providing

Table 1
Alternative investment behavior after a speed-up of demand growth from 2% to 5%

Year	Required capacity	Investment volume	Gross new capacity	Available capacity	Capacity deficit
(a) Investments with perfect foresight and prompt elimination of capacity deficit					
0	100.00	7.73	7.00	100.00	–
1	105.00	31.68	7.14	101.78	3.22
2	110.25	14.10	7.28	103.61	6.64
3	115.76	14.82	7.43	105.49	10.27
4	121.55	15.55	7.58	107.41	14.14
5	127.63	16.33	7.73	109.38	18.24
6	134.01	17.14	31.68	134.01	−0.00
7	140.71	18.01	14.10	140.71	0.00
8	147.75	18.90	14.82	147.75	−0.00
9	155.13	19.85	15.55	155.13	−0.00
10	162.89		16.33	162.89	−0.00
11	171.03		17.14	171.03	0.00
12	179.59		18.01	179.59	−0.00
13	188.56		18.90	188.56	0.00
14	197.99		19.85	197.99	0.00
(b) Investments grow by 20% per year					
0	100.00	7.73	7.00	100.00	–
1	105.00	9.28	7.14	101.78	3.22
2	110.25	11.13	7.28	103.61	6.64
3	115.76	13.36	7.43	105.49	10.27
4	121.55	16.03	7.58	107.41	14.14
5	127.63	19.23	7.73	109.38	18.24
6	134.01	23.08	9.28	112.73	21.28
7	140.71	27.70	11.13	117.67	23.04
8	147.75	33.24	13.36	124.47	23.27
9	155.13	39.89	16.03	133.48	21.66
10	162.89		19.23	145.07	17.81
11	171.03		23.08	159.75	11.29
12	179.59		27.70	178.07	1.51
13	188.56		33.24	200.75	−12.18
14	197.99		39.89	228.60	−30.61
(c) Investments grow by 2% in years 1, 2, and 3, and by 30% in subsequent years					
0	100.00	7.73	7.00	100.00	–
1	105.00	7.88	7.14	101.78	3.22
2	110.25	8.04	7.28	103.61	6.64
3	115.76	8.20	7.43	105.49	10.27
4	121.55	10.66	7.58	107.41	14.14
5	127.63	13.86	7.73	109.38	18.24
6	134.01	18.02	7.88	111.41	22.60
7	140.71	23.43	8.04	113.48	27.23
8	147.75	30.46	8.20	115.59	32.15
9	155.13	39.59	10.66	119.95	35.19
10	162.89		13.86	127.12	35.77
11	171.03		18.02	137.88	33.15
12	179.59		23.43	153.25	26.34
13	188.56		30.46	174.52	14.05
14	197.99		39.59	203.41	−5.42
(d) Investments grow by 2% in year 1, 30% in year 2, 10% in years 3, 4 and 5, and then 20% by per year					
0	100.00	7.73	7.00	100.00	–
1	105.00	7.88	7.14	101.78	3.22
2	110.25	10.25	7.28	103.61	6.64
3	115.76	11.28	7.43	105.49	10.27
4	121.55	12.40	7.58	107.41	14.14
5	127.63	13.64	7.73	109.38	18.24
6	134.01	16.37	7.88	111.40	22.61
7	140.71	19.64	10.25	115.57	25.14
8	147.75	23.57	11.28	120.51	27.24
9	155.13	28.28	12.40	126.26	28.87
10	162.89		13.64	132.91	29.98
11	171.03		16.37	141.81	29.22
12	179.59		19.64	153.38	26.21
13	188.56		23.57	168.10	20.46
14	197.99		28.28	186.57	11.43

critical inputs into the investment process adjust their capacities in years 3, 4, and 5, mineral investments can grow by no more than 10% per year. From year 6, however, the supply of inputs becomes less constrained and annual investment can expand by 20% from that year onwards. With this scenario, capacity deficits and high prices stretch out over about 15 years.

Implications

These scenarios are simplistic in a number of respects. Thus, they do not take into account the extended period of low and falling real prices before the boom, which prompted savage cost cutting that impaired existing installations and that made it hard to achieve full capacity utilization once the boom got going. They also ignore the widespread conviction prevailing before the boom that low and falling prices would persevere, making it hard to believe that the increase in prices, once it occurred, was other than a short-run aberration. Neither do they embrace the managements' unwillingness to invest for fear of recreating the overcapacity that plagued the mineral industries in the decade preceding the price increases (Crowson, 2008).

The scenarios simplistically focus on investments in new capacity that takes 5 years to complete (greenfield projects) and, disregard everything else. For instance, they pay no attention to the fact that high prices due to inadequate capacity will restrain demand growth, and so speed up the attainment of a new market balance.

Yet, despite these simplifications, the model and its scenarios provide useful and important insights into the real world conditions. What they starkly highlight is the fallacy of assuming, because some new greenfield capacity can be created in a 5-year time span, that all the required capacity associated with an unexpected increase in demand growth can be assembled within such a period of time. Producers are unlikely to recognize immediately a new and higher rate of long-term demand growth. Once they do, they face constraints in responding. The short-term surge in investment inputs requirements in terms of equipment, facilities and trained manpower may not be feasible. This limits the growth in investment and may extend the period over which required capacity exceeds actual capacity from 5 years to between 10 and 15 years.

Does this mean the world is in the early stages of a super cycle, of two decades or more of high prices and profits? For two reasons, this seems unlikely. First, we have seen that global recessions have abruptly terminated past commodity booms, and the same could occur with this one in the near future. As these words are written, the United States teeters on the brink of a recession, and even though some claim the world economy no longer depends on what is happening in the United States, others are less sure. Additionally it is plausible that China could experience a hard landing as it strives to rein in its severely overheated economy.

Moreover, even if the global economy continues to sustain commodity demand growth, what our simple numerical scenarios suggest is an investment cycle where the mineral sector and its input providers enjoy high prices and profits for 10–15 years simply because of the inherent problems in expanding capacity rapidly. Less plausible is a super cycle that lasts 20 years or longer. Such an extended period gives both the mineral industry and the industries it depends upon for crucial inputs sufficient time to expand capacity and accommodate the new trend in demand.

Eventually the prices of mineral commodities will approximate their marginal production costs, and this in our opinion implies for copper, oil, and most other mineral commodities a substantial fall in real terms from their current elevated levels. The price fall could, moreover, occur much sooner if, for whatever reason, world

economic growth were to slow down unexpectedly, and remained low for some years. Given the momentum of the investment process, the mineral industries could then face a drawn-out period of hard times.

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