



**Defense Contract Management Agency
Industrial Analysis Center**

**STEEL AND SPECIALTY METALS
TREND ANALYSIS**

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1. Executive Summary:

For the past four years, US manufacturers and distributors of steel products and other strategic materials have experienced sharp price increases and availability problems. Consequently in 2004, Defense Contract Management Agency (DCMA) Industrial Analysis Center (IAC) was tasked to assess and prepare a Steel Fact Sheet for the 2004 Army Material Command's Principal Assistant Responsible for Contracting (PARC) Conference, detailing the short, medium and long-term impacts of steel on the DoD Industrial Base.

Since the initial release of IAC's steel fact sheet and presentation in 2004, many DoD customers have expressed interest in periodic updates on steel and other strategic materials, including titanium, aluminum, copper, nickel and stainless steel. Because the current cycle of price increases has lasted longer than any commodity boom of the past 50 years, and is projected to continue well into the next decade, IAC's initial steel fact sheet has developed into a detailed steel and specialty metals trend analysis report. In 2007, the Office of the Deputy Under Secretary for Industrial Policy (DUSD-IP) requested the IAC to update the report bi-annually. The purpose of the report is to provide trends and analyses to the DoD acquisition community.

Using government and external data sources, the assessment focus on the metals involved in the manufacturing and final assembly of major DoD programs. Data on product availability, pricing, and industry trends were examined. Several reliable data sources utilized for the assessment include, but are not limited to, companies' annual reports, Standard & Poor's Net Advantage, American Metals Market, and the Wall Street Journal. The IAC also utilized insight gained from interviews with company officials during the course of normal business operations.

The economic forecasts in this report are based on best assumptions of events and are current as of July 1, 2008. Nevertheless, dynamics of the global economy are unpredictable, therefore unanticipated industry and market conditions may change the premise for such assumptions.

Since DoD is not a major industry driver for steel and specialty metals, the growing concern within the defense community, especially for Ground Systems and Aircraft program offices, is that the turmoil within the industry could have an adverse impact on cost, schedule, quality and availability of critical steel and specialty metals. Therefore, the trend analysis is comprised of pricing, lead time, capacity utilization and economic and industry factors that influence current and future conditions of the marketplace; the trend analysis intends to assist the DoD Acquisition community in preparing DoD budgets and programs in an environment of increasing material prices.

Four of the six primary metals (copper, titanium, nickel and stainless steel) have stabilized for the first half of 2008. Meanwhile, carbon steel and aluminum have increased in price 73% and 22% respectively since January 2008 (see Figure 2). The slowdown of the American economy, especially within the automobile and construction industries, was not enough to impact any dramatic break in escalation of higher metal prices.

Since the beginning of this decade, global demand has shifted away from mature to emerging economies. Commodity and steel consumption has historically been a strong

indicator of future growth, however, according to the International Monetary Fund, China and India are now the largest contributors to the current phase of world growth and are significant drivers in steel and specialty metals market dynamics.

Because of the changing fundamentals in the global economy, metal prices will probably not go back to pre-2003 levels. Resource-rich Brazil and Russia, coupled with the high demands of India and China, are now competing with Europe and North America for iron ore, scrap metals and other valuable feedstock required for the production of metal-base products.

Looking forward thru calendar year 2009, there are signs of stagflation within the US economy. Stagflation is a term used to describe an economic period of high or increasing inflation combined with high or increasing unemployment. The anticipated unease within the US will likely reduce domestic metals demand in 2009, yet it will probably not affect the upward march of metal prices because of global demand. Nevertheless, production capacity that cannot be sold in the American marketplace will likely be exported to Brazil, Russia, India and China (BRIC) and to companies that are benefiting from the growth rates of those emerging economies that are resilient to the US downturn.

Regardless of the slowing of the American economy projected for 2009, robust global growth in metals production and consumption is forecasted well into the next decade, possibly the next 20 years, and metal prices will remain relatively high. The world is in the beginning phase of a prolonged bull market for steel and specialty metals, not seen since the end of World War II.

A. Steel and Specialty Metals Pricing Trend and Forecast:

The following charts and tables illustrate the pricing trends, price increases/decreases and forecasts for the end of calendar year 2008. As illustrated in Figure 1, metal prices increased an average of nearly 300% since the base year of 2003. The metals industry has increased and must continue to increase infrastructure investments to keep up with global demand.

The six primary specialty metals markets as a group are forecast to rise in price, on average, a modest 10% from July 2008 to December 2008.

Figure 1 illustrates pricing trends for the six primary metals adjusted for inflation with January 2003 as a base year.

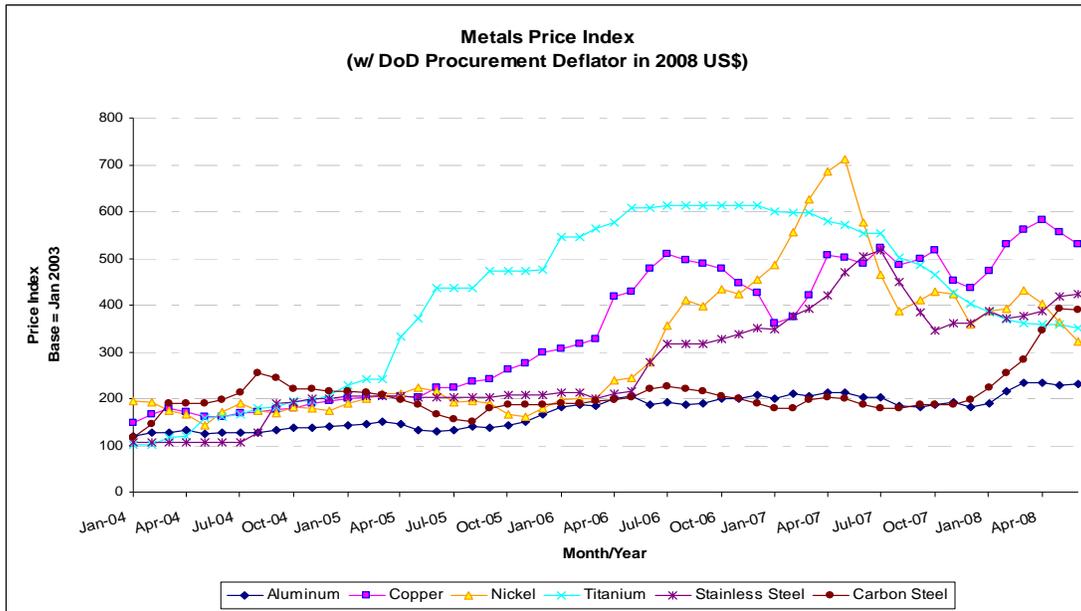


Figure 1 - Pricing Trends

Source: American Metal Market; DCMA-IAC Analysis

Figure 2 shows the average price increase for the six primary metals ending June 2008, with four different time periods (6, 12, 24 and 66 months respectively).

Average Price Increase	Aluminum	Copper	Nickel	Titanium	Stainless Steel	Carbon Steel
Jan 08 - June 08 (6 months)	22%	12%	-17%	-8%	9%	73%
June 07 - June 08 (12 months)	14%	9%	-44%	-36%	-16%	108%
June 06 - June 08 (24 Months)	23%	11%	16%	-42%	52%	77%
Jan 03 - June 08 (66 Months)	131%	431%	223%	252%	325%	289%

Figure 2 - Metals Price Increase

Source: American Metal Market; DCMA-IAC Analysis

Figure 3 shows price projections for December 2008 and associated twelve months percentage increase/decrease.

Price	Aluminum	Copper	Nickel	Titanium	Stainless Steel	Steel
Price based on: \$ per Metric Ton	COMEX spot close	COMEX spot close	Nickel Melting Spot Close	Titanium 6/4 Ingot	North American Cold Rolled 304	North American Hot Rolled Sheet
June - 07	\$ 2,594	\$ 7,303	\$ 42,802	\$ 52,820	\$ 6,371	\$ 575
June - 08	\$ 2,954	\$ 7,937	\$ 23,986	\$ 33,576	\$ 5,357	\$ 1,193
Projected Price						
Jan - 09	\$ 3,700	\$ 8,600	\$ 26,000	\$ 35,000	\$ 5,200	\$ 1,300
Price delta Jan - 08 to Dec - 08	53%	22%	-10%	-4%	6%	89%

Figure 3 - Metals Price Forecast

Source: American Metal Market; DCMA-IAC Analysis; COMEX=Commodity Exchange

B. Steel and Specialty Metals Lead-times:

Figure 4 provides the average lead-time information for commercial applications. Lead-time for military applications can be 3-6 times longer than for commercial usages, due primarily to stringent specifications required for military grade metals. Differences between commercial and military lead-times are also attributed to the level of administrative and government oversight requirements (e.g. Level I sub-safe, safety of flight). Lead-time can be defined as MLT (manufacturing lead time); this takes into account the administrative time period from the initiation of a purchase request to the date the product is delivered. Lead-time can also be defined as PLT (production lead time); PLT only takes into account the time period from the date of firm contract order to the product's readiness for shipment. MLT can be 2-5 times longer than PLT. Figure 4 analysis is calculated with a simple weighted average lead-time based on commercial product lead time.

Figure 4 illustrates *production lead times (PLT)* for the six primary metals. Carbon steel is represented by flat products (plate, sheet, and strip) and round products (steel pipes and tubes). Figure 4 is for informational purposes only and should not be used to benchmark against production performance and indexing for long-term contracts.

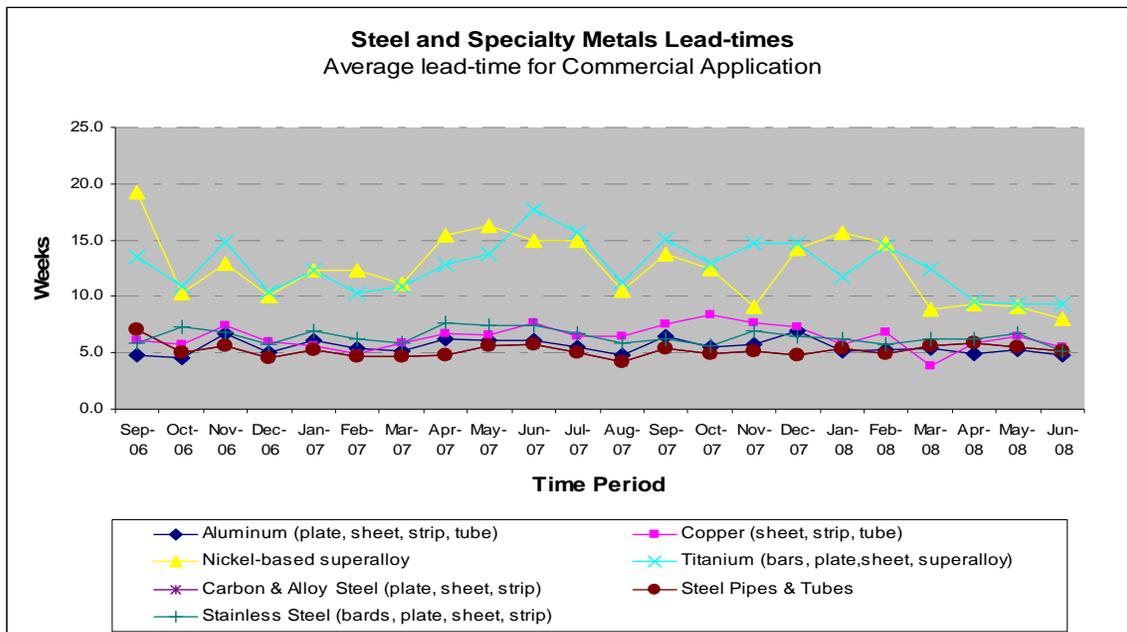


Figure 4 - Steel and Specialty Metals Availability

Source: Purchasing Magazine -Purchasingdata.com -

2. Steel and Specialty Metals Assessment

A. Aluminum:

Aluminum prices hovered around \$3,000 per metric ton in June 2008, and appear to have pierced the physiological price barrier of \$2,700 per metric ton that was set in mid-2007. Aluminum prices have increased 14% for the trailing twelve months ending June 2008. Industry analysts are projecting continued aluminum price increases to approximately \$3,700 per metric ton by January 2009. This will represent an overall

increase of 53% from January 2008 (see Figure 3). The production of aluminum is highly energy intensive; as such, aluminum production has historically correlated with the market conditions of crude oil and natural gas¹. The current spike in crude oil prices may affect the aluminum market within 4 to 10 months or cause a sharp price escalation by spring 2009. Higher energy prices, coupled with industrial and urbanized growth in the emerging markets, have industry analysts projecting aluminum prices to spike well passed \$4,000 per metric ton by mid-2009. This upward trend in prices represents a fundamental change in the marketplace, regardless of the aluminum producers' ability to rapidly meet growing consumer demand by increasing production capacity and/or improving their reclamation logistics network. The aluminum industry is still primed for further global consolidation as firms become more aware of the value added by having a vertically integrated global mining company with multiply mineral products. The current environment of high fuel prices adversely impacting airlines' decision to exercise the options of purchasing additional planes will also adversely impact the aluminum requirement within the aerospace sector. However, most of the scenarios for a downturn in the Aerospace sector will probably not impact Aluminum prices until mid to late 2009.

Historically, in 1987, aluminum prices reached the record high of \$4,290 per metric ton. Yet eight months earlier, aluminum was priced at \$1,620 per metric ton. Adjusted for inflation, \$4,290 in 1987 represents \$7,733 per metric ton in 2008 dollars.

B. Carbon Steel:

The industry considered the \$695 per metric ton for hot-rolled steel in the summer of 2006 an apex moment, and that it could not go higher than \$800 per metric ton. In June 2008, hot-rolled steel reached \$1,200 per metric ton. Despite a slowdown in the American economy, the global demand was too strong to maintain an \$800 or lower price level. Industry analysts have reconsidered the carbon steel market paradigm that has historically represented the peaks and valleys in the marketplace, mostly in North America and Europe. Industry analysts have now recognized that the new market paradigm will not return to pre-2003 fundamentals and that a different dynamic has propelled the industry to enter into a bull market phase that may last 15 – 20 years; mostly driven by the industrialization of the emerging markets. Forecasts for the second half of 2008 show prices remaining within a \$1,200 - \$1,300 per metric ton range (see Figure 3).

C. Copper:

After the dramatic drop in copper prices for the second half of 2006, copper prices climbed back up to \$8,645 per metric ton in April 2008. Currently, copper prices are at \$8,000 per metric ton, and it appears will even out at \$8,600 for the rest of the year (see Figure 3). At \$4/lb., one can see why there is a black market in illegal copper reclamation; hoarding just 25 lbs. of stolen copper can easily fetch \$100 today and an excess of \$100 tomorrow. Copper is primarily used in building construction, wiring and also for its electromagnetic properties, however high prices and tight supply may convert buyers to substitute it for the less expensive aluminum. The military primarily uses copper indirectly in the manufacturing of brass casting for small caliber ammunition. An

¹ American Metal Markets, June 2008

initial investigation by the Industrial Analysis Center discovered that copper prices increased 10%-12% since October 2007, the beginning of FY08, affecting fixed contracts to purchase brass castings. Currently, the new copper price support level is \$7,000 per metric ton. The implication is that copper prices will not fall below \$7,000 per metric ton anytime in the foreseeable future. The copper market fundamentals are still strong and industry analysts affirm that it is too soon to forecast a bearish market for copper. The Industrial Analysis Center projects copper prices to be approximately \$8,600 for the rest of 2008. This is primarily based on the slow growth and eventual contraction of the US construction industry and copper producers offsetting those losses by exporting to China what cannot be sold in North America.

D. Nickel:

The marketplace for nickel is primarily driven by the overwhelming demand for stainless steel and, to a lesser extent, demand for super alloy. The spot price for nickel on the COMEX closed at \$23,986 per metric ton in June 2008; down 20% since January 2008. The nickel market overheated in 2007 and appears to have stabilized for the first half of 2008. This stabilization may continue through the rest of the year. Moreover, the stabilization in nickel prices can be attributed to the recent global consolidation and market concentration of the mining industry (e.g. Xstrata/Falconbridge, Vale-Inco). Prior to the current market condition, nickel prices volatility contributed to a jump of over 200% from May 2006 to May 2007, followed by a 45% price drop through August 2007. Since August 2007, nickel prices have oscillated approximately 10%-15% every few months. Going back to 2006, these conditions have contributed to the disruption of company logistics networks throughout the nickel industry. Service centers and end-item customers have experienced difficulties in proper inventory management and price forecasting. Nevertheless, the strong global demand for stainless steel means that nickel demand will remain strong for years to come. With strong demand and higher production costs from new sources, nickel prices are likely to remain at least close to current levels for years to come. For the second half of 2008, there are signs of a slight uptick in the market; nickel prices are projected to increase 5% - 8% by January 2009, or \$26,000 per metric ton (see Figure 3). The rationale being that during the month of June 2008, nickel prices reached a low of \$22,000 per metric ton and now prices are creeping back up to meet second half demand.

E. Stainless Steel:

Price for the industry's standard product, cold-rolled stainless 304 coil, was \$5,357 in June 2008; compared to \$6,370 reported for a year earlier - June 2007. Industry has projected prices to remain stable in the \$5,100 to \$5,500 range through the end of 2008 (see Figure 3). Stainless steel prices have been unexpectedly higher than normal in 2007, thus customers started to substitute the standard 304 with the less expensive 201 product (201 contains less nickel alloy). Although stainless steel is very beneficial for its anti-corrosive properties, higher prices have caused customers to use substitutes such as cheaper imports, aluminum, low alloy carbon steel, plastics or composites. Despite the forecasted availability and increased production capabilities of the stainless steel producers, this substitution effect is partly contributing to the stabilization of stainless steel prices that will continue into early 2009. A second factor

that is partly contributing to stainless steel market contraction is the dramatic slowdown in the domestic automobile and construction industry. However, slowdown in the automobile and construction industry may lead to higher costs for DoD customers to cover overhead increases.

F. Titanium:

The average price for Titanium Ingot (Aerospace grade 6-4) during June 2008 was approximately \$33,576 per metric ton; down 8% from the \$36,640 per metric ton reported in January 2008. As reported in the November 2007 Steel and Specialty Metals Trend Analysis Report, the Ti marketplace is relatively relaxed as compared to the turmoil of 2006. The three domestic titanium producers have boosted capacity to support the upcoming growth in the aerospace market and more capacity will come on line through 2010. The delays in Airbus A380, Boeing 787 and Lockheed Martin JSF have given breathing room for buyers that were anticipating a shortfall in titanium availability. Prices will stabilize around \$30,000 to \$35,000 per metric ton for the remainder of 2008 (see Figure 3).

Despite the current environment of high fuel costs that are adversely impacting airlines' decision to exercise the options to purchase additional planes, looking forward, the aerospace industry (especially A380, B787 and JSF production) will continue to be the main driver of titanium production, availability, and pricing. There is also a big push to utilize low cost non-aerospace grade Titanium for armor applications. This new market, coupled with increases in domestic production capacity, will be contributing factors to titanium pricing stabilization leading into 2009. Over the long-term, rising demand and relatively tight supplies will likely keep titanium prices near current levels or higher.

3. Influences on the Metal Markets:

A. Root Cause for Price Upswing:

Over the past three years, world demand, particularly Chinese and other emerging economies, have not subsided and the weak US dollar contributed to increasing metal prices. As the emergence of scrap metal increased in its importance for feedstock, domestic scrap exported at a faster rate than expected. Furthermore, mining, metal producers and service centers, mindful of their missteps and the market conditions of the 1990's through 2003, were more hesitant in increasing their inventory levels, total overhead costs and adding production capacity, until they had a better understanding of risk and return when developing new business projects to meet forecasted demands. Prices for inputs and raw materials such as oil and gas, transportation costs, iron ore, coke and scrap metal have also contributed to tight market conditions.

An additional root cause for the price upswing was that the metals industry could not anticipate and ramp up their operation as fast as the turnover of the US economy did after the recession of the late 1990's and the negative market conditions right after September 2001.

In the past, when an increase in demand occurred, companies were quick to mine and produce more materials, thus creating over-production in the marketplace, and when

demand abruptly subsided, they were stuck with high inventory levels and under-utilized plants eroding their profit margins. Rising input costs, especially energy and labor (global skilled labor shortage in many mining industries), are also contributing to rising metals costs. The metal companies are now better able to properly manage their production operations; however, the price of metals could remain high for a long time, adding to the metal and mining companies' high profit margins.

B. Specific Factors for Fiscal Year 2008 Price Stabilization:

- *Expansion of indigenous programs.* As the economies and infrastructure of emerging countries mature, they generate their own internal supply and demand of intermediate goods and services, becoming more self-sufficient and less reliant on exports.
- *Slowdown of US economy.* The US economy had a sluggish GDP growth rate - less than 1% for the past two quarters, business inventory has increased because merchandise could not be sold, and unemployment edged above 5%. The combined performance of the automobile and construction industries has adversely impacted the overall US economy.
- *Increased global vertical and horizontal market consolidation.* Throughout the metals industry, companies streamlined their supply chain and improved the communication network, and as a result limited lag-time effects and price swing deviations.
- *Better market forecasting and attention to end-item customers.* The metals industry has *increased* enterprise understanding of risk and return before committing to projects. They have also practiced better production scheduling that takes into account end-item customer demand and the entire value chain rather than production scheduling solely based on the immediate customer demand. This has led to better control of inventory levels, production scheduling and logistics network operations.
- *Metal and Mining companies' new expansion programs.* The metals industry is experiencing the near completion of facility upgrades, purchase of newer equipment and the implementation of new cost structures to meet the emergent demand.

C. Domestic Capacity Utilization:

According to the US Federal Reserve, typically, capacity utilization rates above 82% are a signal that price increases will follow. It is also a signal that inflationary pressures will trickle throughout the US economy.

- Primary Metal products – NAICS 331
 - For the first half of 2008 (January - June), capacity utilization for primary metals, the first stage of metal manufacturing, was 85.6%, compared to the historical average of 81%. In May 2008, it was 83.9%.

- Fabricated Metal products – NAICS 332
 - For the first half of 2008 (January - June), capacity utilization for fabricated metals, the second stage of metal manufacturing, was 80.5%, compared to its historical average of 78.2%. In May 2008, it was 80.3%.

This suggests that steel and metals demand are at the threshold percentage of 82%. And at present, with today's US economic conditions, the metals industry is facing inflationary pressures. Analysts are also suggesting that these pressures will continue well into 2009. Yet, if the auto industry continues to have a prolonged contraction of production into 2009, inflationary pressures for metal products for this market will have a limited effect.

D. Forecast:

1 Near-term (July 1, 2008 – December 31, 2008)

- Continue to anticipate stabilized prices across the board for the second half of 2008. There should be a slight up-tick in carbon steel and aluminum prices because of higher energy and raw material costs. After the dramatic drop in copper prices for the second half of 2006, copper prices climbed back up to \$8,645 per metric ton in April 2008. The price of copper is forecasted to be approximately \$8,600 for the rest of 2008. Nickel and Stainless Steel markets will see stabilization in prices and availability as the auto and construction markets continue to decline. Titanium market dynamics will continue to depend on the effects of delays with the Lockheed Martin's JSF, Airbus' A380 and A350, and Boeing's 787, yet Ti should not see any dramatic downward trend in pricing to pre-2003 levels.

2 Mid-term (January 1, 2009 – December 31, 2009)

- There are steady signs that the Federal Reserve is preparing to increase interest rates; this will lead to a slowing domestic demand for metal products. However, it will not cause any significant decline in prices because the production cost structure has reached a level that cannot be lowered further for the mid-term. This in part, may result in increased inventory levels that will provide more incentive to export.
- Mid-term will bring the commencing of a stronger US dollar. This could accelerate foreign ownership of domestic mills and metal processing facilities. The rationale is that foreign firms that are deliberating whether to purchase US steel and specialty metals facilities have to make firm decisions in 2009 and lock in current rates before the US dollar appreciates further which would make any investment projects too expensive to justify.

3 Long-term (2010 and beyond)

- The US economy is no longer the driver of world economic growth, thus pricing trends in the US will follow the global market rather than

the opposite. The global market currently dictates a prolonged bull market period for steel and specialty metals.

- Titanium production expansion should come on line in time for full rate production of the Boeing, Airbus, and Lockheed Martin aerospace programs. The full rate production timeframe begins in 2012.
- Super alloys not mined or melted within the United States will become a growing strategic concern because of the United States need to access a secure supply of super alloys (i.e., chromium, cobalt, rare earth and platinum group metals).

Historically, the US metal market was very sensitive to economic conditions and followed a traditional, cyclical and predictable pattern (peaks and valleys). There is a lag-time effect that produces a “bull-whip” type of pattern for indicators such as demand, production, prices, imports and inventory levels. The current business cycle of “ups and downs” can no longer be substantiated with historical data to follow the traditional pattern. The business cycle of the future suggests a steady upward movement more like the copper price index illustrated in Figure 1. Every price ceiling previously forecasted by seasoned industry analysts has been breached. Therefore, it is too soon in the current phase of the emerging market industrial revolution to forecast a definitive price ceiling. The world market conditions have profoundly changed; the economies of China, India, and the Former Soviet Republics are increasingly affecting the United States economy and will continue to do so well in the future.