

The Outlook for Ferro-Manganese, Silico-Manganese and Ferro-Chrome

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Abstract

Beginning with an analysis of both the crude steel and stainless steel markets from a historical viewpoint, this paper will discuss expected growth in the steel sector, with particular attention given to the high growth rates in stainless steel output. In addition, it will analyse the structural changes underway in the steel industry with the rapid growth of EAF production at the expense of BOF output, assessing the impact of these trends on demand for ferro-alloys. An analysis of how supply will cope with changing ferro-alloy requirements will be addressed, with special attention given to the ability for producers to switch production capacity between alloys as well as the fundamental issue of overcapacity in the ferro-alloys industry. The impact of trade with China and the CIS is also addressed, with particular attention paid to the ease with which Chinese producers can switch capacity between ferro-alloys, as well as the impact upon the ferro-chrome market of the recent disruption to Kazakh ferro-chrome production. A thorough examination of these market fundamentals will culminate in an analysis of the market balance and price outlooks for these alloys through 2002.

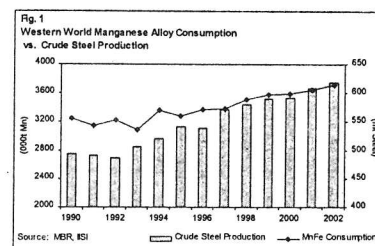
Introduction

After experiencing surging international prices in 1995, ferro-manganese, silico-manganese and ferro-chrome prices have all declined in recent years. Ferro-chrome prices led the last ferro-alloy bull market in 1995, spiking in the third quarter to 83¢/lb. Silico-manganese prices quickly followed the upturn in ferro-chrome prices, peaking in the fourth quarter of 1995 at \$850/tonne. Ferro-manganese prices did not experience a dramatic increase, but did strengthen, rising to \$545/tonne in the first quarter of 1996. The price peaks were short-lived, with ferro-chrome prices cut in half within six months and falling to a low of 40¢/lb by the fourth quarter of 1996. Silico-manganese prices also spent only a brief time at the peak, falling through 1996 to a low of just under \$530/tonne in the first quarter of 1997. Ferro-manganese prices returned to below \$500/tonne six months after the price peak, spending 1997 in the more traditional range of \$465-480/tonne. An analysis of demand for these alloys and an examination of supply side developments will provide insight into why the price rallies tend to be short-lived and when the next bull markets for these ferro-alloys are likely to occur.

Demand

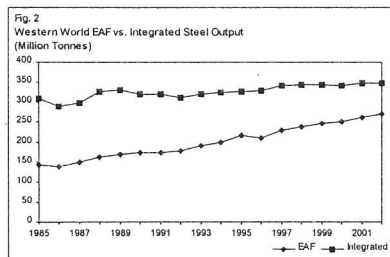
As noted in the introduction, prices of the three alloys under consideration, ferro-chrome, ferro- and silico-manganese, have moved in a similar fashion in recent years. However, even though all are raw materials for the steel industry, the demand side characteristics could hardly be more different. The manganese alloys serve an industry where production is growing by around 1% per annum, while the demand for ferro-chrome is set by stainless steel which has a long term growth rate of around 4.5%.

Although crude steel production is only growing at 1% per annum, the demand patterns for the individual manganese alloys are quite different. Demand from the crude steel sector represents approximately 90% of total ferro-manganese and silico-manganese consumption. Within the crude steel industry, demand for ferro-manganese is derived primarily from blast furnace, integrated steel mills whereas consumption of silico-manganese is centred in electric arc furnace (EAF) steel mills.



Within total crude steel output, a significant trend is the ongoing shift towards higher EAF production at the expense of integrated output. In 1985, EAF steel production represented merely 33.9% of total crude steel output versus 66.1% from integrated producers, namely blast furnace and to a much lesser degree, open hearth furnace steel mills. However, by 1997, EAF producers increased their share of production to 42.5%, with integrated mills facing a diminishing share at 57.5%. This trend is forecast to continue in the coming years, with EAF steel output forecast to increase to 45.5% of total crude steel production by 2002, leaving integrated producers with the

remaining 54.5% of production. MBR is predicting long-term growth for EAF output to far exceed growth rates for integrated steel production, as depicted in the following chart. In the coming years, EAF steel production is expected to rise at an average rate of 3-3.5% per annum, in contrast to average growth of less than 0.5% per annum for Western World integrated steel output.



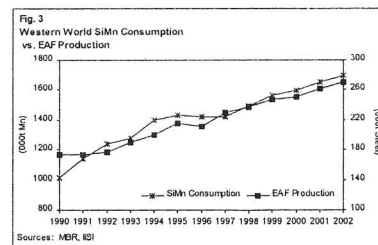
EAF mini-mills primarily produce high-manganese, low-carbon content steels used in structural products, which tend to allow for higher levels of residual silicon, and hence, favour silico-manganese. In contrast, integrated mills, particularly those involved in producing steel sheet, tend to prefer ferro-manganese inputs as their products have tighter silicon specifications. Furthermore, refined grades of ferro-manganese and silico-manganese are benefiting from increasing demand for low-carbon clean steels which prefer low- and medium-carbon ferro-manganese or silico-manganese to high-carbon ferro-manganese additions. However, the product mix at EAF mills is gradually shifting towards higher production of high quality bars and flat products, items traditionally produced at integrated steel mills. Although this is the start of a new trend, MBR believes that the implications for manganese alloy consumption are minimal as flat product output as a percentage of total mini-mill output is still small.

Although, as detailed earlier, there are certain trends within the carbon steel sector that point to differential growth rates for the manganese alloys, the key determinants are the level of steel output and the breakdown between integrated and EAF production. As we are seeing at present in Southeast Asia, the construction sector is one of the first victims of an economic crisis, leading to depressed demand for steel structural products. Hence, cuts in crude steel production in Asia thus far in 1998, have come almost exclusively from the EAF mini-mill sector, negatively impacting demand for silico-manganese, but having less of an effect on ferro-manganese consumption.

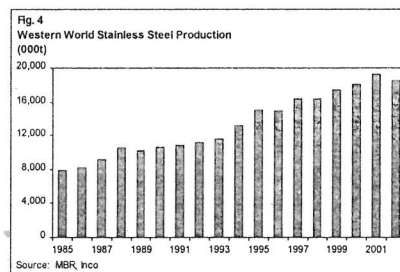
EAF steel output receded in 1996 after rising by over 8% year-on-year in 1995 to 215.9m tonnes, following declining output in Western Europe, particularly in Italy. Strong positive growth resumed last year, with Western World EAF output gaining over 9% to 230m tonnes, supported by positive growth in each of the major producing regions. Although positive growth is forecast to continue this year, gains will be more moderate and will come almost exclusively from Western Europe and North America as Asian output slows. In contrast, although growth in integrated steel output is occurring at a much slower pace, growth remained stable in 1996 at 328.2m tonnes despite the downturn in total crude steel

production, supported by continued expansion in Asia. In 1997, integrated output gained 4.4% year-on-year to 342.5m tonnes as crude steel output increased throughout the Western World. However, in 1998, integrated steel output is expected to slow, with production remaining stable at 1997 levels.

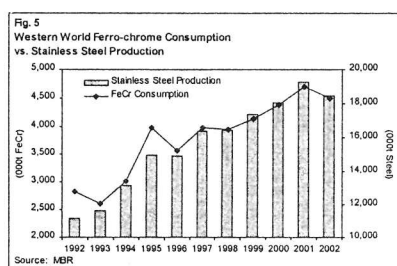
Although the level of demand for manganese alloys is ultimately determined by the level of steel output, the relationship is by no means linear. Expansion in crude steel production last year was not reflected in manganese alloy consumption figures due to widespread inventory drawdowns of stocks collected during 1996. However, in 1998, growth in manganese alloy consumption is forecast to exceed the growth rate for crude steel production as consumers are forced to resume purchases of manganese alloys and are likely to replenish stocks while prices remain low. Hence, after falling by just under 1% in 1997, consumption of high-carbon ferro-manganese is forecast to rise by 2.6% in 1998, gaining to 1.58m tonnes. Silico-manganese consumption is forecast to rise by nearly 5% this year to 1.49m tonnes after rising a mere 0.1% in 1997. Western World silico-manganese consumption is expected to be supported this year by the continuing shift towards increased EAF production in North America and Western Europe, offsetting the anticipated decline in Asian consumption this year due to cutbacks in Japanese and South Korean EAF output, in particular.



Over the longer term, silico-manganese consumption is forecast to resume positive growth in Asia, with Western World consumption forecast to rise at an average rate of 3.3% per annum from 1998 to 2002. Demand for silico-manganese will continue to be supported by growth in EAF crude steel production, with high-carbon ferro-manganese demand limited by flat integrated steel production. High-carbon ferro-manganese consumption is forecast to decline at an average rate of just under 1% per annum through 2002.



Turning to stainless steel production, growth has been much more rapid in recent years, with longer term growth rates averaging around 5% per annum. For 1998, however, stainless steel output is expected to slow, and possibly even decline, as the Asian crisis diminishes consumption. The reduction in output is likely to occur at the established producers such as Japan, Western Europe and the USA, rather than at the emerging producers of the Far East. Unless the newcomers actually close down due to losses, they have every incentive to maximise output - the need to quickly pay down debt and to maximise the benefits of currency devaluation. As such, we expect the weakness to be concentrated in Japan (where production cuts are already in place) and Western Europe and the USA where output may be cut despite the healthy level of underlying demand. Over the longer term, Western World stainless steel production is expected to resume more rapid growth rates, with average annual growth between 1998 and 2002 forecast at approximately 4.5% per annum.

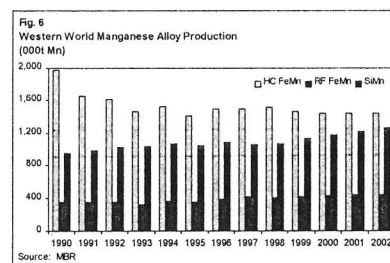


Supported by strong gains in stainless output in 1997, high-carbon ferro-chrome consumption rebounded last year, rising over 11% to 3.97m tonnes. In 1998, ferro-chrome consumption will be negatively affected by the downturn in the Asian economies, with consumption expected to decline approximately 5% year-on-year in this region. Although Asian stainless output is forecast to remain stable this year as gains in the less affected economies, particularly Taiwan, China and India, offset losses in the nations where the crisis is centred, notably South Korea, Thailand and Japan, apparent ferro-chrome consumption will decline as inventories are drawdown and consumption of new material falls. For the Western World as a whole, high-carbon ferro-chrome consumption is forecast to fall by approximately 1% this year to 3.94m tonnes. In the coming years, high-carbon ferro-chrome consumption will expand at a positive rate, following the trend of increasing stainless steel output. Over the longer term, high-carbon ferro-chrome consumption is forecast to gain at an average rate of 4% per annum.

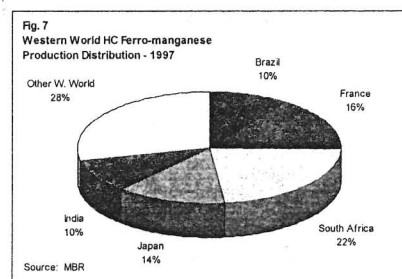
Supply

Although the geographical distribution of the production of manganese and chrome alloys is very different, they do, however, share some similar supply side characteristics - low rates of capacity utilisation at most Western producing nations coupled with the ability of China and the CIS to significantly boost exports to the 'West' depending on prices and ore availability. The ability of producers both in the 'West' and in the former socialist countries to switch production further complicates the supply side picture.

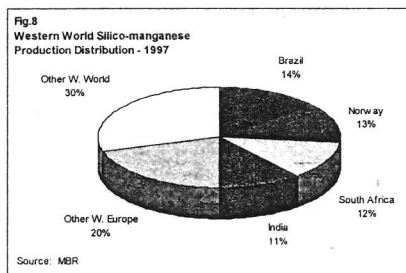
Positive consumption growth for silico-manganese and ferro-chrome, in particular, is reflected in planned ferro-alloy production in the coming years. As consumption shifts towards higher silico-manganese demand in lieu of high-carbon ferro-manganese, ferro-alloy producers are shifting production in a similar direction. As depicted in this chart, a dramatic shift away from high-carbon ferro-manganese production is evident. Silico-manganese output is rising steadily through 2002, as is refined ferro-manganese production, supported by increasing demand from EAFs and by rising end-user demand for low-carbon content steels.



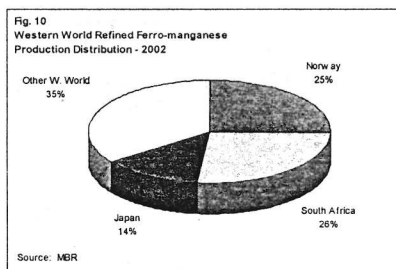
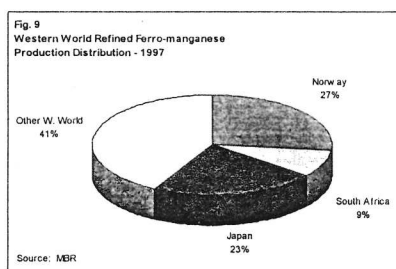
Western World high-carbon ferro-manganese production is centred in South Africa and France, representing nearly 40% of total output, with an additional 35% of production from Japan, Brazil and India. In the coming years, the distribution of high-carbon ferro-manganese production in the Western World is not expected to change substantially, however, a shift towards higher production in South Africa and lower output in Japan and India is anticipated.



The major producers of silico-manganese in the Western World are Brazil, Norway, South Africa and India, contributing 50% of total output, with other Western European countries, most notably Spain, Italy and France, adding a further 20%. The distribution of Western World silico-manganese production is forecast to remain relatively unchanged through 2002, however, South Africa will be increasing its market share over time at the expense of smaller producers.



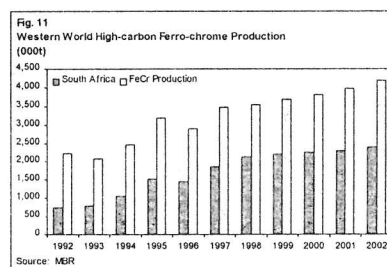
In contrast, the distribution of Western World refined ferro-manganese production will change significantly in the coming years, largely due to the construction of new production facilities in South Africa. South African production of medium and low-carbon ferro-manganese is set to increase following the start-up of two joint venture projects between South African manganese ore producers and Japanese manganese alloy producers this year. Following the decision to invest in a new refined ferro-manganese production facility in South Africa, Japanese producer Japan Metals & Chemicals is closing its domestic ferro-manganese capacity in 1998. Hence, South African production share is forecast to rise from a mere 9% in 1997 to 26% in 2002, whereas Japanese output will decline from 23% last year to 14% in 2002.



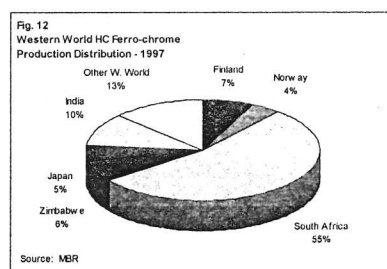
The lowest-cost ferro-manganese, silico-manganese and ferro-chrome production facilities tend to be situated in areas with close proximity to ore supplies due to the dominance of ore cost in total alloy production costs, as well as in areas with inexpensive electricity supplies, particularly for ferro-chrome and silico-manganese. Ore costs and electricity costs each represent approximately 25% of total average production costs for ferro-chrome and silico-manganese, with ore costs representing a larger percentage of total ferro-manganese costs. With regard to ore costs, a number of alloy producers benefit from supply arrangements with manganese ore suppliers or through joint ownership of mines and smelters as integrated producers. Examples include SFPO in

France where ore from Comilog's manganese mines in Gabon is processed at the company's manganese alloy plants. Similarly, in Norway, Elkem and BHP have joint ownership of the Elkem Mangan manganese alloy plants, with BHP supplying manganese ore to the Norwegian facilities.

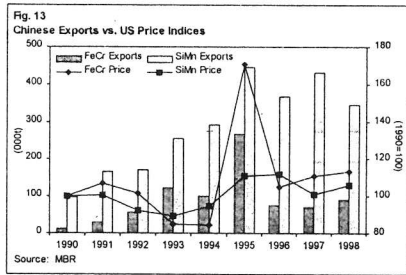
The ferro-alloys industry is characterised by overcapacity and low capacity utilisation rates. Even in 1995 and 1996 when manganese alloy prices peaked, capacity utilisation rates remained in the range of 60-65%. Hence, the ability of producers to substantially increase operating rates, and therefore ferro-alloy output, will impose a cap on prices in the longer term and also means that any price spikes are short-lived. Through 2002, capacity utilisation rates in the manganese alloy industry are forecast to remain below 70%.



High-carbon ferro-chrome production is dominated by South Africa, accounting for 55% of total Western World production. Together, India, Finland, Zimbabwe, Japan and Norway contribute an additional 32% with each country representing between 4-10% of the total. Through 2002, South Africa is expected to increase its dominant market position as producers add additional ferro-chrome furnaces in the coming years. Capacity additions are planned at Samancor's Ferrometals facility, at Hemic Ferrochrome, and the construction of a new ferro-chrome plant by the Northern Transvaal Development Corporation is also scheduled.

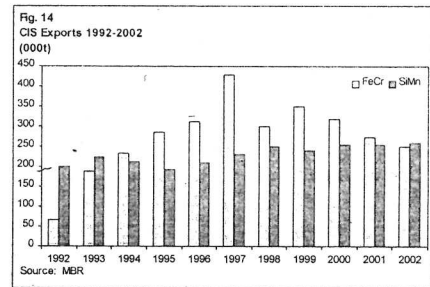


Of all of the producers which can shift the production of alloys, perhaps China is the best example. The industry is characterised by a large number of small furnaces capable of quickly converting capacity in response to market conditions. As depicted in this figure, Chinese suppliers rapidly increased exports in 1995 amidst rising international prices for ferro-chrome and silico-manganese. The subsequent softening in prices in 1996 and 1997 was partly due to the negative pressure on prices imposed by excess supplies of Chinese material available in the market.



It is electric furnace ferro-alloy capacity that tends to be converted between silico-manganese, ferro-chrome, ferro-silicon and silicon metal production. There also exist ferro-alloy facilities that can opt to produce either ferro-manganese or silico-manganese, such as Sadaci in Belgium, depending upon market conditions. Although Western World furnace conversions are less prevalent for ferro-chrome and silico-manganese than for ferro-silicon and silicon metal, there are a number of Western producers that have converted, or are considering converting furnaces. In recent years, South African producers were active in switching capacity between ferro-chrome and silico-manganese, as seen at a number of Samancor's operations in 1996 and 1997, in particular. However, despite the current tightening in ferro-chrome supply and weakening silico-manganese market conditions, South African producers have no plans as yet to switch capacity away from silico-manganese output to ferro-chrome production this year, instead choosing to operate existing ferro-chrome furnaces at high capacity utilisation rates.

Exports from China and the CIS have a profound effect on the market balances for ferro-chrome and silico-manganese. Although both China and the CIS also produce high-carbon and refined ferro-manganese, ferro-manganese exports are limited with the bulk of production consumed internally, hence, having a lesser effect upon the international market. Exports of ferro-chrome from the CIS increased steadily following the break-up of the Soviet Union, as depicted in this figure. Silico-manganese exports have remained relatively stable since 1992 at between 200,000-230,000 tpy, representing approximately 10% of total Western World consumption. The CIS possesses approximately 1.6m tpy of silico-manganese capacity, however, the industry has been operating at only 40-50% of capacity in recent years after running at around 85% of capacity in the late 1980s. More than half of CIS ferro-manganese capacity is also idle with less than 50% of an estimated 466,000 tpy of high-carbon capacity utilised and only a fraction of refined ferro-manganese capacity in operation in the CIS. Although there is the potential for some increases to manganese alloy output within the CIS, a return to anywhere close to previous nameplate capacity is unrealistic due to financial and logistical problems.

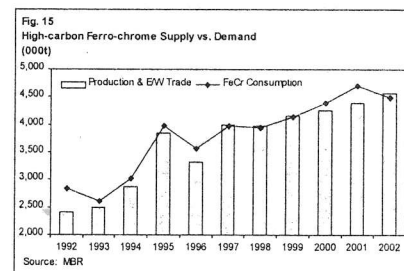


However, CIS ferro-chrome producers have fared better in recent years, particularly in Kazakhstan following the injection of capital from Trans-World into Kazakhstan's Aksu Ferro-alloy Plant. CIS exports of ferro-chrome jumped from 67,000 tonnes in 1992 to 428,000 tonnes in 1997. Over this period, CIS exports as a percentage of total Western World ferro-chrome consumption increased sharply from merely 2% of consumption in 1992 to 11% last year.

However, in late 1997, ownership disputes erupted between Trans-World and the Aksu Ferro-alloy Plant. The conflict has resulted in a near ceasing of output at the plant and a sharp decline in Kazakh ferro-chrome exports. Hence, in 1998, ferro-chrome exports from the CIS are expected to fall 30% from the 1997 peak to 300,000 tonnes.

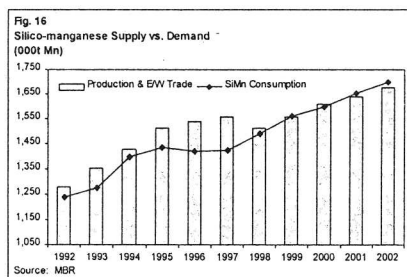
Market Balances and Prices

This withdrawal of Kazakh ferro-chrome this year led to expectations of rapidly increasing ferro-chrome prices in 1998. However, in the first half of the year, prices have exhibited only limited improvement with a slight strengthening in spot market prices and producer contract prices were rolled over in both the first and second quarter of the year from last year's prices. South African producers have not pushed exceedingly hard for price rises for fear of encouraging high-cost producers to restart idled capacity. Furthermore, uncertainty surrounding the Asian markets this year, particularly regarding stainless steel production, has resulted in a degree of wariness about market conditions in the latter half of 1998. These factors should continue to cap price rises for much of 1998.



Despite a likely recovery in demand from stainless steel mills next year, rising production, particularly in South Africa, and the resurgence of Kazakh exports will result in continued market surplus, depressing prices. Prices are anticipated to fall by 6-8% year-on-year in 1999, falling to 45-46¢/lb. However, the market is forecast to move into deficit in 2000 and 2001 as strong demand from the stainless industry and decreasing exports from China and the CIS offset further gains in Western World production. MBR believes that average ferro-chrome prices could move towards 70¢/lb in 2000. However, the chronic overcapacity within the industry will mean that such spikes are short-lived and that prices early in the next millennium will fall back below 50¢/lb.

After peaking in late 1995 and early 1996, manganese alloy prices were depressed through 1997 despite a resurgence in demand from the crude steel sector primarily due to destocking. In 1998, the economic crisis in Southeast Asia is the most significant factor in the international market for manganese alloys. Crude steel production is declining, particularly in the form of reduced EAF steelmaking. Although demand for silico-manganese in Asia is expected to decline this year, strong demand for material from North America and Western Europe, as well as declining Chinese shipments, will help to stabilise prices and provide limited upward momentum as the year progresses. High-carbon ferro-manganese prices have been supported early in the year by a shortfall in supply following a number of production disruptions, particularly in South Africa and France, last year. Prices are anticipated to remain elevated in the first half of the year, before softening in the latter half of the year as normal supply conditions return. Oversupply, particularly with the start-up of new South African capacity, is expected to continue to suppress refined ferro-manganese prices, with expectations of a further 3-5% decline in prices this year.



In the coming years, of the manganese alloys, silico-manganese prices are forecast to make the strongest gains. The silico-manganese market is forecast to move into deficit next year as a resurgence in demand from Asian EAF steel mills supports the market. We expect average prices to make gains through most of the forecast period, peaking at \$650/tonne in 2002.

High-carbon and refined ferro-manganese prices will not fare as well, with these markets expected to face excess supply through 2002. With integrated crude steel production slipping in the coming years, high-carbon ferro-manganese prices will remain under downward pressure through most of the forecast period, falling to \$450/tonne in the USA and DM730/tonne in Europe by 2002. Refined ferro-manganese consumption will be supported by rising demand from the steel industry, due to increasing production of low-carbon content steels. However, increased Western production will limit pricing gains in the coming years. In the longer term, refined ferro-manganese prices are forecast to rise by 1-4% year-on-year through 2002, reaching approximately \$955/tonne in the US market and DM1,410/tonne in Europe.

Conclusion

In conclusion, we expect the brightest prospects to be for silico-manganese and ferro-chrome in the coming years. Growth rates for stainless steel production will far exceed future growth in crude steel output, and furthermore, within crude steel production, growth in EAF output will surpass growth in integrated output. Hence, these alloy markets will be propelled by strong demand from the EAF steel sector, in the case of silico-manganese, and continued rapid growth in stainless steel production supporting ferro-chrome consumption.

The distribution of Western supply is unlikely to change significantly in the coming years, with the exception of the ongoing shift towards higher South African market share at the expense of smaller, higher-cost producers. However, the presence of excess, idle capacity in these markets will continue to serve as a ceiling on prices in the longer term which will mean that any repetition of the price hikes seen in recent years will be temporary. Moreover, the ever present threat of increased exports from China and the CIS will also limit the duration of future price spikes, with sharp pricing gains, on average, not expected to last for more than six months. Nevertheless, the margins for ferro-alloy producers serving the growing markets of silico-manganese and ferro-chrome should be attractive in the longer term.