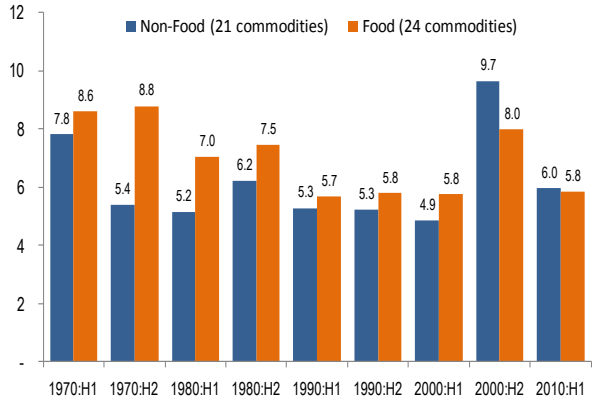
Box 2. Commodity prices: levels, volatility, and comovement

Applying a standard measure of volatility to 45 monthly prices during 1970-2012 shows that even though historically non-food prices have been less volatile than food prices, non-food price volatility exceeded that of food prices by a wide margin (9.7 versus 8.0) during 2005-09. Furthermore, while non-food price volatility reached record highs during 2005-09, food price volatility did not—i.e., food price volatility during the recent boom has been high but not unprecedented. This result is remarkably similar to Gilbert and Morgan (2010, p. 3023) who concluded that food price variability during the post-2004 boom has been high but, with the exception of rice, not out of line with historical experience. And, there is some evidence that volatility has come down to historical norms during the past 3 years (box figure 2.1). Two factors may account for the high volatility during 2005-09: the move from a lower to higher price equilibrium and the 2008 financial crisis. The latter is supported by the fact that volatility increases sharply when August 2008 is included in a two-year moving average, while a similar decline becomes apparent when January 2011 is included in the average (box figure 2.2).

In addition to increased levels and volatility, commodity prices have been moving in a more synchronous manner. In fact, price comovement during the second half of the past decade has been the highest compared to the 43-year sample period (box figure 2.3). Moreover, while there is some evidence that comovement has moderated recently, it is still high by historical standards. The increase in comovement implies that common factors have been the dominant force behind post-2004 commodity price movements (box 3 elaborates further on this point).

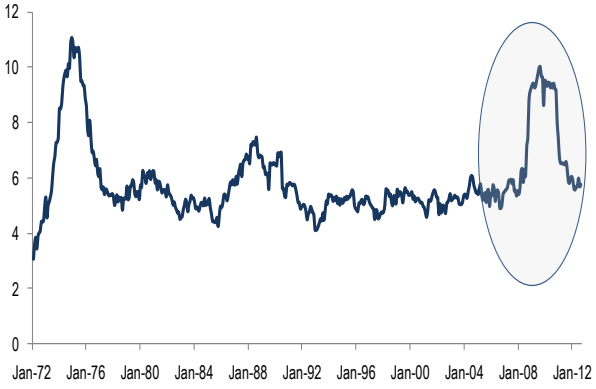
Price volatility is calculated as the median of 100*STDEV[*log p(t)) - log p(t-1)*] for 21 non-food and 24 food prices, where STDEV denotes standard deviation, *p(t)* is the current price of each commodity, and *p(t-1)* is the one-period lagged price (their logarithmic difference is the so-called returns). The measure is applied to five-year periods, denoted as H1 and H2 for the first and second part of each decade, respectively (2010:H1 includes 36 observations because the sample ends in December 2012). Volatility is also presented as a two-year trailing moving average. Apart from its simplicity, this measure of volatility is appropriate for non-stationary variables, which is typically the case with commodity prices. Comovement is measured as a two-year trailing moving average of ABS[*n(up)-n(down)*]/[*n(up)+n(down)*], where ABS is the absolute value operator and *n(up)* and *n(down)* denote the number of prices that went up and down during the month. The index can take values between zero (when half of the prices go up and half go down) and unity (when all prices move in the same direction). While random chance is expected to an equal num-

Box figure 2.1 Commodity price volatility: food and non-food (5 year averages)



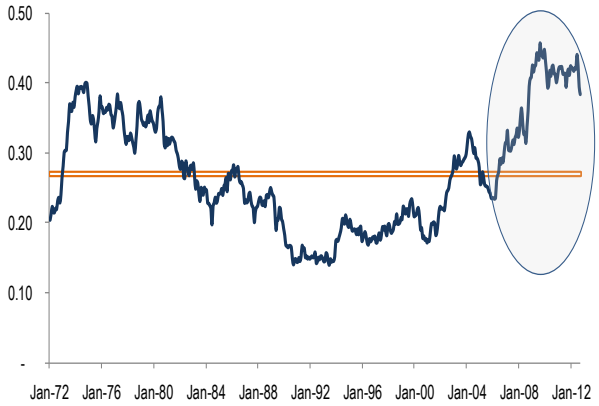
Source: World Bank

Box figure 2.2 Commodity price volatility: all commodities (2-year trailing moving average)



Source: World Bank.

Box figure 2.3 Commodity price comovement



Source: World Bank.

ber of increases and declines, because of common factors, the index is likely to take values well above zero. Indeed during 1970-2012 the index averaged 0.27, implying that of the 44 commodities of the sample, on average, 16 prices went up (down) and 28 prices went down (up). Two key advantages of the index are that (i) it measures comovement across a large number of prices (difficult to measure using parametric models), and (ii) it is not subjected to degrees of freedom limitations. However, these advantages come at the expense of measuring direction of change only, not magnitude, thus underutilizing the informational content of prices. The index has been used in the financial literature (see, for example, Morck, Yeung, and Yu (2000) on the measurement of equity price comovement in emerging economies).

slowing further over the longer term as copper intensity in China—which has risen sharply—plateaus.

Copper mine production, which was flat in 2011, has not kept pace with consumption for a number of reasons: technical problems, labor disputes, declining grades, delays in start-up projects, and shortages of skilled labor and inputs. The tightness in copper production has been pronounced at the world's two largest mines, Escondida in Chile and Grasberg in Indonesia. However, high copper prices have induced a wave of new mines that are expected to come on-stream shortly—in several African countries, China, Peru, and the United States, for example.

Nickel prices rose modestly in early 2012 before receding due to the sluggish market for stainless steel (the end use of more than two-thirds of nickel production) and the rapid restart of nickel pig iron (NPI) production in China. China now accounts for 40 percent of global stainless steel production, up from 4 percent a decade ago. Stainless steel demand is expected to remain robust in the medium term, growing by more than 6 percent annually, mainly driven by high-grade consumer applications, initially in high-income countries and, increasingly so, in emerging economies as well. A wave of new nickel mine capacity is expected to keep nickel prices close to marginal production costs, however. Several new projects will soon ramp up production, including those in Australia, Brazil, Madagascar, New Caledonia, and Papua New Guinea. Another major global source of nickel is NPI in China, which sources low-grade nickel ore from Indonesia and the Philippines. China's production capacity may soon be constrained, though, given that Indonesia has announced that it will develop its own NPI industry and has introduced export quotas and may ban nickel ore exports by end-2013.

Outlook for metals

Overall, metal prices are forecast to increase marginally in 2013. Aluminum prices are expected to increase almost 3 percent and remain at that level through 2015 due to rising power costs and the fact that current prices have pushed some producers at or below production costs.

Nickel prices are also expected to increase almost 3 percent in 2013, and to follow a slightly upward trend thereafter. Although there are no physical constraints in these metal markets, there are a number of factors that could push prices even higher over the forecast period, including declining ore grades, environmental issues, and rising energy costs.

On the contrary, copper prices are expected to decline 2 percent in 2013 and as much as 10 percent in 2014, mostly due to substitution pressures and slowing demand.

Precious metals

Precious metals prices increased less than 2 percent in 2012, a significant slowdown compared to the previous two years, during which increases of 37 and 28 percent, respectively, occurred (figure 12). Nonetheless, 2012 was the eleventh straight year of higher nominal prices of precious metals, as measured by the precious metal index, mostly reflecting their attractiveness "safe-haven" investment assets. The price of gold spiked twice in 2012, once during 2012Q1 on heightened tensions with