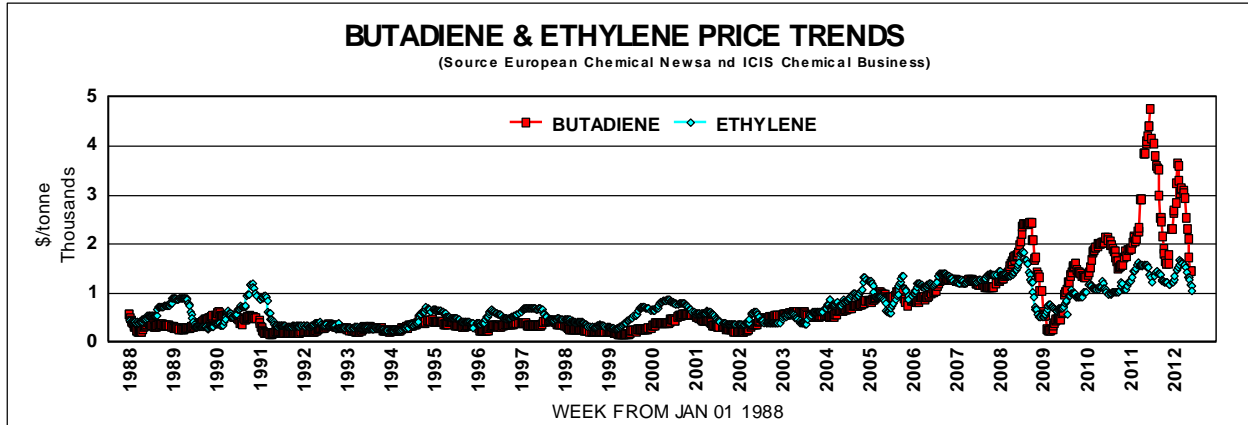


C1: BUTADIENE PRICE HISTORY AND TRENDS

Butadiene is principally produced in the steam-cracking of naphtha and gas oil to produce light olefins and in particular ethylene. The figure illustrates the reported EU spot price for butadiene and ethylene from 1988 to mid 2012. The price curve clearly falls into two parts, before and after about mid 2008.



Prior to 2008 butadiene and ethylene were very similarly priced. There were some transitions when ethylene rose in value above that of butadiene, for example 1989, 1991, 2000. On closer inspection we see that for most of this early period ethylene was valued slightly higher than butadiene.

Post 2008 the relative values reversed, with apart from a period in early 2009, the value of butadiene exceeded and sometimes by a large margin the value of ethylene, and sometimes, as in 2011, by a very large margin.

One problem contributing to the margin is the high cost of butadiene transport which generally requires the use of small, specialist vessels which inhibits rapid movement across the globe. So the question is what has caused this change in the relative price of butadiene and ethylene? The period 2008-2009 is the period of the Global Financial Crisis (GFC) and in the run up to this crisis and its immediate aftermath there were considerable volatility in the price of all hydrocarbon (oil derived) products. So It would be unwise to draw conclusions from this period.

For 2010 onwards, the conventional view would be that the high butadiene price is due to the change in supply/demand balance with the relative quantity of butadiene/ethylene falling as the amount of ethylene produced by ethane cracking (particularly in the Middle East) rising – ethane cracking yields very little butadiene. This results in a shortage of supply relative to the every increasing demand (particularly for vehicle tyres which use styrene-butadiene rubber).

One of the problems with butadiene production from alternative sources is that these are considerably more capital intensive than extraction of butadiene from cracker-C4 streams. The old (1960s) butane C4 dehydrogenation route (CatadieneTM) is still practiced, however, especially if butane is priced at world parity, was uneconomic until the rise in prices after 2005. Clearly if the price differential persists we may see new investments in the dehydrogenation route and the emergence of alternative routes which could use bio-feedstocks or the re-emergence of old acetylene based technology where the acetylene is made from coal.