Wooing investors to prevent cyclicality

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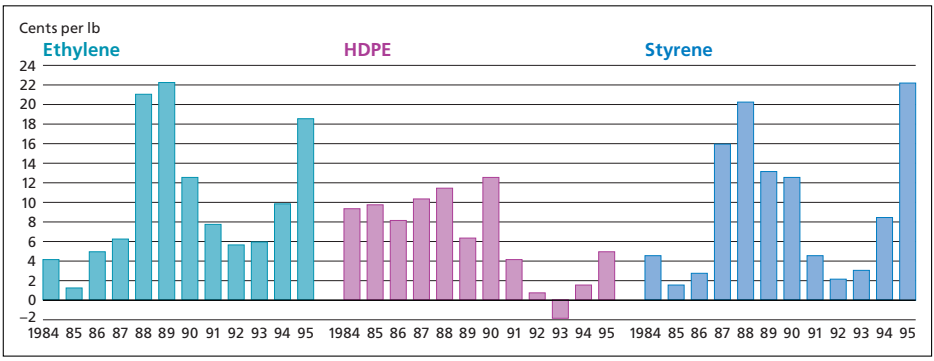
Producers of commodity chemicals have long been plagued by cyclicality, which causes huge swings in prices and thus in operating margins. At the top of a cycle, the return on invested capital (ROIC) can approach or exceed 100 percent; in a trough, it can drop well below a company's cost of capital for prolonged periods (Exhibit 1).

Exhibit 1

US commodity chemical margins



Such volatility causes difficulties for managers making strategic and operational decisions. Annual returns can be judged only in the context of a full cycle (although it is difficult to judge when a cycle begins and ends), while decisions about investments costing hundreds of millions of dollars may have to be considered during periods of poor – or even negative – operating returns.

Not surprisingly, much has been written about how companies might manage cyclicality. But to manage it effectively, we need to know what drives and sustains it – and here there is little consensus.

A common view in the chemicals industry is that the supply/demand balance is upset when additional capacity comes on stream in large lumps – because of the need to capture economies of scale – rather than gradually. A second hypothesis, put forward by some academics, is that companies mistime investments because they are unsure of other suppliers' capacity. A third holds that supply/demand imbalances are caused by companies' tendency to invest at the top of the cycle, when returns are high (and funds are available) but demand is about to peak. A fourth is that producers planning new capacity often forecast demand inaccurately.

All four theories are plausible. But because each has different implications for what companies might do to gain competitive advantage in a cyclical commodity

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industry, it is helpful to be able to test each theory to see how far it drives cyclicality.

To do this, we developed a business dynamics model of an industry producing a typical commodity chemical and tested each theory. The results were unambiguous. Structural cost advantage, such as a superior feedstock, location, or technology position, enjoyed by a minority of companies, is likely to be more rewarding than attempts to manage the cycle. The majority of companies without a big structural cost advantage would, however, be wise to try to manage the cycle by first removing the financing constraints that prevent them from investing in a downturn, and second, learning to forecast demand more precisely.

Modeling cyclicality

A commodity industry's performance is determined by three elements: structure, pricing, and participants' investment decisions. In turn, investment decisions are affected by the way companies measure and interpret information about the supply/demand balance, now and in the future.

A business dynamics model can deal with such complexities. Our model simulates the cost structure, economics, and investment behavior over 60 years of a company producing a typical commodity chemical (terephthalic acid) that is owned by a chemicals conglomerate with many autonomous business units (like BASF, ICI, or DuPont). Growth in demand requires the industry to make frequent decisions about the timing and size of investments. These decisions are governed by a number of economic and operating imperatives, such as the need to return cost of capital over the long term and to maintain an average spare capacity margin of 10 percent. There are also rules dictating how and when companies expand new plants, or mothball or shut old plants when utilization is low.

In this way, the model is able clearly to show the level of price cyclicality that occurs as a result of the four different hypotheses:

- "Lumpiness" of supply-side additions to capacity in relation to growth in demand
- Uncertainty about supply-side capacity
- Poor timing of investments caused by a corporate center's unwillingness to provide finance in a price trough
- Uncertainty about demand when new capacity is due to come on stream.

Exhibit 2

Four hypotheses about causes of cyclicality

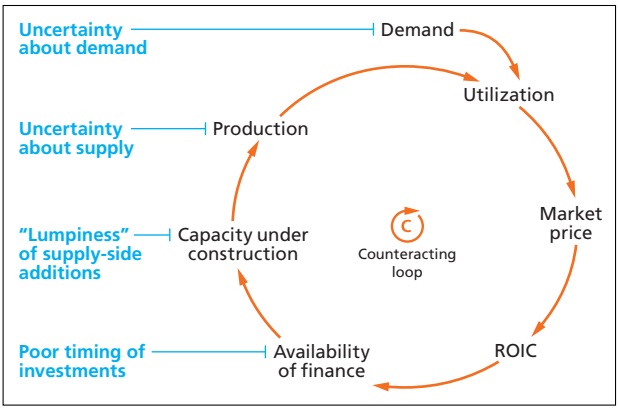


Exhibit 2 is a simplified dynamic loop showing the point at which each hypothesis might affect supply and demand in the capital investment process.

Modeling the relationship between the business unit and its corporate center is especially important in understanding the constraints on financing new investments when prices slump. We simulated a typical situation in which a corporate center is unwilling to release investment funds in a price trough. Its reluctance causes a delay in the building of new capacity. If that capacity were to come on stream as demand wanes, the desired steady balance between supply and demand could easily be disrupted. The willingness of a corporate center to finance investment in a cyclical business unit is expressed as a combination of recent returns on invested capital and the industry's expected future capacity utilization. (Companies seeking to raise finance on capital markets find themselves in a similar situation: new capital can be raised more quickly during a boom than in a slump.)

The model was used for two purposes: first, to test how each hypothesis affected prices in relation to a base case in which there was both perfect information and perfect execution of supply-side decisions; and second, to explore the relative merits of trying to improve returns through better cycle management (by investing countercyclically, for instance), rather than via other value-creating levers such as achieving structural advantage.

Several possible drivers of cyclicality

After running the simulation model under various conditions, we found that three of the four hypotheses could be validated, and that two of them were particularly powerful drivers. The fourth hypothesis – that poor information about other suppliers' capacity causes supply and demand to fall out of line – did not appear to be valid.

"Lumpiness" of supply-side additions in relation to growth in demand. When new capacity was added in very large increments it was possible to generate reasonably realistic price cyclicality – but only if these increments were large compared with demand growth. (This commonly happens when an industry first develops or when a product is mature and growth has slowed.) Hence, this driver may be relevant only at certain times in the life of a product.

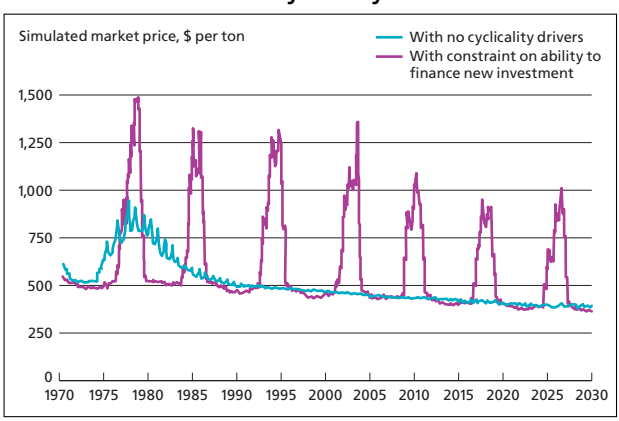
That said, there are other factors apart from product maturity that determine whether capacity increments are large compared with demand growth. In most chemical industries, the minimum economic plant size increases quite rapidly as a result of technological innovation, and can result in very lumpy supply-side additions. On the other hand, when industries become large, annual growth of no more than 3 or 4 percent may make world-scale supply-side increments look modest.

Uncertainty about supply-side capacity. In the simulation, realistic price cyclicality could be generated only when the market as a whole was unaware how much new supply was in the pipeline – an unlikely situation in most chemical industries. Exceptions might include new industries or obscure sectors in which participants are geographically dispersed and receive little if any media or market research coverage.

Poor timing of investments caused by investors' unwillingness to provide finance in a price trough. When investment was constrained during a price trough, price cyclicality in the simulation was similar to that observed in actual chemical industries (Exhibit 3). When the financing

Exhibit 3

Prices with and without cyclicality



constraint was removed and investment allowed at any time in the cycle, cyclicality disappeared.

Uncertainty about demand when new capacity is due to come on stream. When demand growth was given even a small degree of cyclicality, in line with medium-term gross domestic product cycles, realistic patterns of price cyclicality were generated. The industry was unable to forecast demand accurately, and persistently miscalculated the supply/demand balance. In reality, we would expect companies to learn about GDP cycles and time investments accordingly. However, demand for chemical products is often extremely volatile regardless of GDP cycles (because of the effects of stocking or destocking, for example, or a technology change).

Overall, the analysis indicated that construction delays and imperfect information make a production/investment cycle of the type commonly observed in commodity chemicals inherently unstable, particularly on the demand side. Once the system is thrown into disequilibrium, it is difficult – if not impossible – to bring it back into balance.

Active cycle management or structural advantage? Most managers in the chemical industry realize that while eliminating cyclicality might be desirable, it is also unlikely. It would require the industry to consolidate to a point where only a handful of companies controlled supply and demand – and those companies to exert the necessary pricing and investment discipline over long periods. There are few if any instances of this happening in the industry. Even in relatively concentrated sectors such as hydrogen peroxide and titanium dioxide, prices remain cyclical. Returns may also be poor, as they are among aspirin and paracetamol producers.

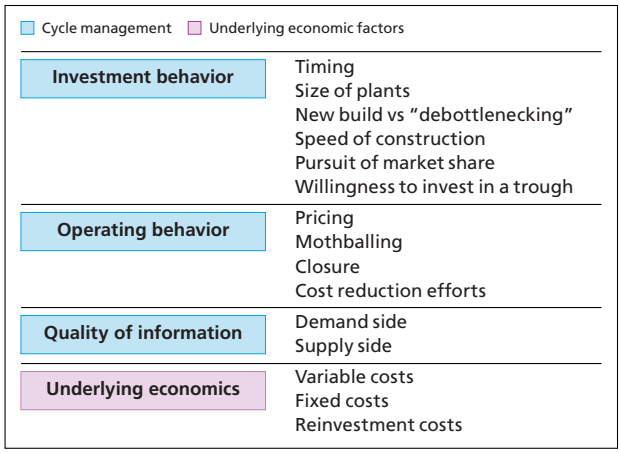
If cyclicality is here to stay, the question is how to gain competitive advantage from managing it better. We used the model to explore how returns could be improved through active cycle management (Exhibit 4). We looked particularly at the effect of having the finance available to invest at the right time in the cycle.

The simulation involved taking a single company with an initial market share of 20 percent that competes for market share in the troughs and economic surplus in the peaks. In this way, we captured the key dynamics of competitive responses, especially when the company attempted to expand its market share rapidly through aggressive investment.

In one scenario, the company had the advantage of variable or fixed costs that were respectively 20 percent or 40 percent lower than the industry average, while being subject to the same investment constraints as the rest of the

Exhibit 4

Levers available to management

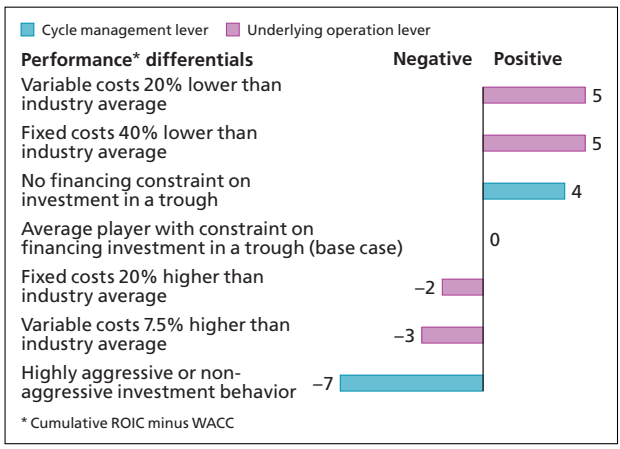


industry. Over 60 years, each advantage yielded an average performance lead over competitors of 5 percent (Exhibit 5).

In a second scenario, financing constraints were relaxed so that the company could make investments at the right time in the cycle, despite having the same cost structure as the rest of the industry. The strategy proved a sound one, yielding a performance improvement of 4 percent.

Exhibit 5

Sources of competitive advantage



Structural advantages of the magnitude assumed in the first scenario – arising from feedstock, location, or technological factors – are not uncommon in the chemicals industry. They explain, for example, the dominance of the US Gulf Coast, the Middle East, and certain other locations in the

production of basic petrochemicals. If a company possesses advantages of this sort, sustaining them is likely to be more rewarding than the greater task of attempting always to invest at the right time in the cycle.

Most companies, however, are not fortunate enough to enjoy structural advantage. For them, active cycle management can be a way to achieve superior returns. They should above all address financing constraints. This means rethinking the relationship between business units and the corporate center so that that long-term business needs, such as committing funds for building capacity in a trough, are not overridden by short-term bookkeeping considerations.

Managers also need to be able to project demand more accurately – a capability often little developed in chemical companies. Investing relatively small sums to understand the dynamics of demand for chemical products, such as price elasticity with competing materials, can go a long way toward reducing profit volatility in a cyclical environment.