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## **Bubble Trouble**

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The economist John Maynard Keynes is famous for saying that "markets can remain irrational longer than you can remain solvent". Our version of this is that "markets can remain solvent longer than you can remain rational". The fear of missing out is a powerful force. Today, the market "solvency" is fundamentally driven by low interest rates and the trillions of stimulus that has been pumped in by major central banks.

While it is difficult to predict if we are in a bubble and even harder to predict when it will burst, there are always markers that hint at the excesses of the market – increasing instances of fraud, unrestrained IPOs, and a narrative about changing the world and near infinite growth potential. These markers become more obvious when you look at individual industries. Perhaps the most obvious example today is electric vehicles.

The electric vehicle (EV) industry – comprised of an index of car manufacturers, battery producers and charging station businesses – currently trades at 20 times the aggregate revenue generated by the companies. In financial parlance, this industry has a price to sales (P/S) ratio of 20. This is very expensive and implies a high level of future growth that may or may not materialise. For comparison, an index of the 10 largest incumbent car manufacturers (some of which have a fledging portfolio of electric vehicles in the pipeline) trades at a price to sales ratio of only 0.4.

Going by these valuations, the market is implicitly betting that companies in the EV space can grow revenues 50 times faster (4900%) than the incumbents, even though the incumbents are also going to become manufacturers of electric vehicles. Also, many of the EV manufacturers are not profitable and rely on the kindness of markets to fund themselves.

While believers like to draw parallels to the large technology companies of today before they became profitable, manufacturing an electric car has very different unit economics to a software business. For one, it is more capital intensive so returns-on-capital will be closer to a traditional internal combustion engine car manufacturer than a software business. Also, successful software businesses have zero marginal cost economics. In plain English, this simply means that the cost of producing an additional "unit" of goods or services approaches zero. Think eBay, PayPal, and Microsoft. EV manufacturers do not have this advantage.

The British bicycle mania of the 1890s has a lot of parallels with the EV market today. Breakthroughs in tire and gear technology made bicycles a convenient form of transport. Most of the bicycle companies were based in Birmingham, arguably the Silicon Valley of England at the time. A study from Queen's University showed that 671 companies raised £27 million in 1896 (1.6% of British GDP at the time). Within a few years, half of the listed companies had failed, and investors saw peak-to-trough declines of over 70%.

The irony is that the investors participating in the bicycle mania were fundamentally not wrong, even though they lost money in aggregate. Their bets, in aggregate, were that bicycles would be a more popular form of transport in the future. Indeed, bicycles did become a more popular form of transport after the 1890s.

However, successfully investing in new technology is not only a function of spotting a secular trend. It is critical you don't overpay for the promise of growth. And paying 20 times sales for a low margin, low return-on-capital business like car manufacturing is overpaying. Also, picking the winners in advance is very difficult. There will be a lot of financial carnage as the EV market matures. At times like these, it is important to remain rational even as markets remain ever solvent.

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