

Have we overdosed on techno-optimism?

Brian Williamson¹, 2022



“Today America’s financial system looks nothing like it did before the crashes of 2001 and 2008, yet lately... a queasy feeling among many investors that they have overdosed on techno-optimism.” The Economist, 12 February 2022

I’m not going to tell you whether you should buy or sell stocks, but I will offer some thoughts regarding the consistency of a set of beliefs.

We have been through a previous tech boom and bust, the Dot-com crash of 2000 which wiped out the previous five years of gains in the NASDAQ (telecoms stocks also crashed).

With hindsight, we arguably needed more ubiquitous and capable fixed and wireless

networks and deeper ‘tech’ innovation to generate high value applications, and the past two decades have seen that play out. Lower cost debt has also contributed to higher valuations.

But are our views of value, future economic growth and the discount rate consistent?

Innovation and productivity growth

Let’s start with productivity growth which, as Paul Krugman put it “isn’t everything, but in the long run, it’s almost everything.” The reason for this is that there are only two drivers of growth in GDP per capita, one of them is how much people work and the other is how productively they work.

Information and communications technology (ICT) is estimated to have made a substantial contribution to productivity growth, 0.5% per annum or more in the US and Europe, from the mid 1990s up to just before the financial crisis.²

More recently both aggregate productivity growth and the contribution of ICT have fallen away, which is both somewhat puzzling³ and contested as to whether the fall is temporary or not.

Grounds for optimism regarding a return to rates of productivity growth approaching historical levels include the application of AI; whilst grounds for pessimism include the fact that the slowdown in productivity growth from around 2007 has proved persistent.

The current value of tech companies is arguably dependent on a return to a higher economy wide productivity contribution.

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² Bart van Ark, Productivity and Digitization in Europe: Paving the Road to Faster Growth, *Digiworld Economic Journal*, no. 100, 4th quarter, 2015. https://papers.ssrn.com/sol3/papers.cfm?abstract_id=2845368

³ Byrne and Sichel, The productivity slowdown is even more puzzling than you think, 22 August 2017. <https://voxeu.org/article/productivity-slowdown-even-more-puzzling-you-think>

Who captures the gains from innovation?

Whilst rapid innovation and productivity growth do benefit at least some innovators, most of the benefits ultimately go to consumers – a pattern that has played out through successive waves of general-purpose technologies including steam, electricity and computing.⁴

Therefore, whilst there is a weak linkage between the gains to society as a whole and the gains to investors, investors are unlikely to benefit if the gains to consumers and society are small i.e. if demand is limited.

Nordhaus estimates that innovators were able to capture about 2.2 percent of the total surplus from innovation during post-war period in the US non-farm business sector.⁵

Interestingly, from today's perspective, Nordhaus considered that entry and the easy demise of new economy firms was, with few exceptions, easy; and for that reason and others that the tech valuations pre the Dot.com crash were not justified (Nordhaus assumed a discount rate of 10%).

Tech value, future growth and social surplus

The value of GAFAM is around \$9.2 trillion, whilst the value of the top ten tech stocks is around \$10.2 trillion (excluding Tesla, which is arguably in a different category). Further, the top ten represent roughly 50% of the value of all tech companies.⁶

Whilst these are large numbers, they represent the present value of future earnings, and should therefore be compared with the present value of GDP or a GDP increment.

Whilst Nordhaus made assumptions regarding innovation and appropriability to estimate the long-run share of gains from innovation captured by enterprise, here we compare the market cap of tech companies with the present value (PV) of future growth increments attributable to tech.

This provides a 'top-down' basis for considering the consistency of tech value against assumptions regarding the tech contribution to future GDP, alongside the Nordhaus 'bottom up' estimates of the share of surplus captured overall by business.

The following inputs are assumed in calculating the present value of the GDP increment⁷:

- Global GDP is \$87 trillion (World Bank). Upper-middle and high-income countries make up over 90%.
- Baseline GDP growth is 1.5% per annum, excluding the tech contribution. Tech is assumed to add a growth increment in the range 0.1-0.5% per annum.
- A discount rate of 3.5%.

The results are shown in the table below and compared with the market cap of the top ten tech companies of \$10.2 trillion.

Tech value vs Δ GDP NPV ⁸			
Growth Δ	0.1%	0.2%	0.5%
Δ GDP PV \$ trillion	231	488	1460
Tech value vs Δ GDP PV	5.1%	2.4%	0.8%

One might argue that the tech share of surplus is too high if one is pessimistic about the future

⁴ David and Wright, "General Purpose Technologies and Surges in Productivity: Historical Reflections on the Future of the ICT Revolution." 1999. <http://www.nuffield.ox.ac.uk/economics/history/paper31/a4.pdf>

⁵ Nordhaus, "Schumpeterian profits in the American Economy: Theory and Measurement." April 2004. <https://www.nber.org/papers/w10433>

⁶ <https://companiesmarketcap.com>

⁷ Present value of incremental growth impact: $GDP * \int_0^{\infty} (e^{g+\Delta g t} - e^{g t}) / e^{r t} . dt = GDP * \{ \frac{1}{r-(g+\Delta g)} - \frac{1}{r-g} \}$ for $(g + \Delta g) < r$; where r is the discount rate, g is the base growth rate and Δg is the growth increment.

⁸ Implicit in the comparison is that the most valuable tech companies will be reasonably long-lived since the value of economy wide productivity gains, to which their value is compared, are evaluated assuming an infinite time horizon.

contribution of tech to growth. Alternatively, should they're contribution to growth return to levels seen previously, then the share of value reflected in market cap appears unexceptional.

Further, if one views the share as high then increased competition between existing tech companies and entry is more likely⁹; as might be additional regulation and antitrust targeted at tech. However, there is a risk that ill-judged rules could reduce not only the value of tech but also its contribution to growth. As The Economist commented:¹⁰

“The large and fluid tech ecosystems offered by Alphabet, Amazon, Apple and others show the complexity of the task: they are in an innovative phase with new services being created that are highly popular and they increasingly compete with each other. It would be easy to erode the quality of their products with ill-judged rules.”

The discount rate and growth prospects

Finally, current low productivity and income growth rates and a low discount rate are linked. A return to faster productivity growth would therefore be expected to be accompanied by a higher discount rate¹¹, so the net impact on company value is mitigated. Value may be oversensitive to the discount rate alone if the counterpart implicit economic growth rate is not factored in.

Conclusion

The value of tech companies appears broadly in line with economy wide shares of surplus captured by firms, provided the tech sector continues to contribute to economy wide

productivity growth at levels at, or even below, those seen historically. Arguably we have not overdosed on techno-optimism.

Whether you believe that, however, depends on your view of future productivity growth prospects, the part that tech will play in future productivity growth and the impact that regulation and anti-trust may have in promoting or harming future productivity growth and in altering the share of surplus captured by tech companies.

⁹ The Economist, Metamorphosis: Facebook and big-tech competition - Why the technology-industry narrative of the 2010s no longer stacks up, 4 February 2022. <https://amp.economist.com/cdn.ampproject.org/c/s/amp.economist.com/business/2022/02/04/metamorphosis-facebook-and-big-tech-competition>

¹⁰ The Economist, In defence of the consumer welfare standard, 29 January 2022.

<https://amp.economist.com/leaders/2022/01/29/in-defence-of-the-consumer-welfare-standard>

¹¹ The HM-Treasury Green Book (2020) Annex 6 proposes a discount rate of $r=1.5+g$, where the growth rate (g) is assumed to be 2% per annum i.e., $r=3.5\%$. Higher/lower growth is therefore linked to a higher/lower discount rate.

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