Global Markets Comment: Some Simple Macro AI-rithmetic

Dominic Wilson
+1(212)902-5924 |
dominic.wilson@gs.com
Goldman Sachs & Co. LLC

Vickie Chang
+1(212)902-6915 |
vickie.chang@gs.com
Goldman Sachs & Co. LLC

- The most important question for the US equity market outlook may be whether the market is correctly valuing the benefits from AI. Our portfolio strategy team has argued that company valuations are high, but not yet at bubble levels. A macro approach can be helpful because it sets constraints on what is collectively possible.
- The present discounted value of the capital revenue from AI for the US economy is highly uncertain, but our baseline estimates are for around $8tn, with a plausible range of $5tn to $19tn. Those benefits are enough to justify current and anticipated levels of investment spending. But the value of AI-related companies has risen by over $19tn since the introduction of ChatGPT and companies in the semiconductor space and AI model-builders alone have added more than $8tn in value.
- Not all of those gains reflect the value of AI. And the ultimate benefits could certainly be larger if the share of AI revenues going to capital is unusually high or if US companies capture a larger portion of global AI-related revenues. But these simple calculations suggest that the market may already have built in a significant amount of the potential value from AI up front, largely in companies directly involved in or adjacent to the AI boom itself.
- Forward-looking markets should price gains well ahead of time. And just because we have built in significant valuation gains already does not mean that we cannot build in more. As long as both the economy and the AI investment boom remain on track, we think markets are likely to take a more optimistic view. But the simple arithmetic here supports our view that market pricing is well ahead of the macro impact.

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Some Simple Macro AI-rithmetic

The most important question for the US equity market outlook may be whether the market is correctly valuing the benefits from AI.

Our portfolio strategy team has argued that company valuations are high, but not yet at bubble levels. A macro approach to that question can be helpful, because what may look reasonable for each company may not be reasonable for all of them. By considering the limits to the boost to economy-wide earnings that even a large productivity boost can plausibly deliver, the macro perspective sets constraints on what is collectively possible.

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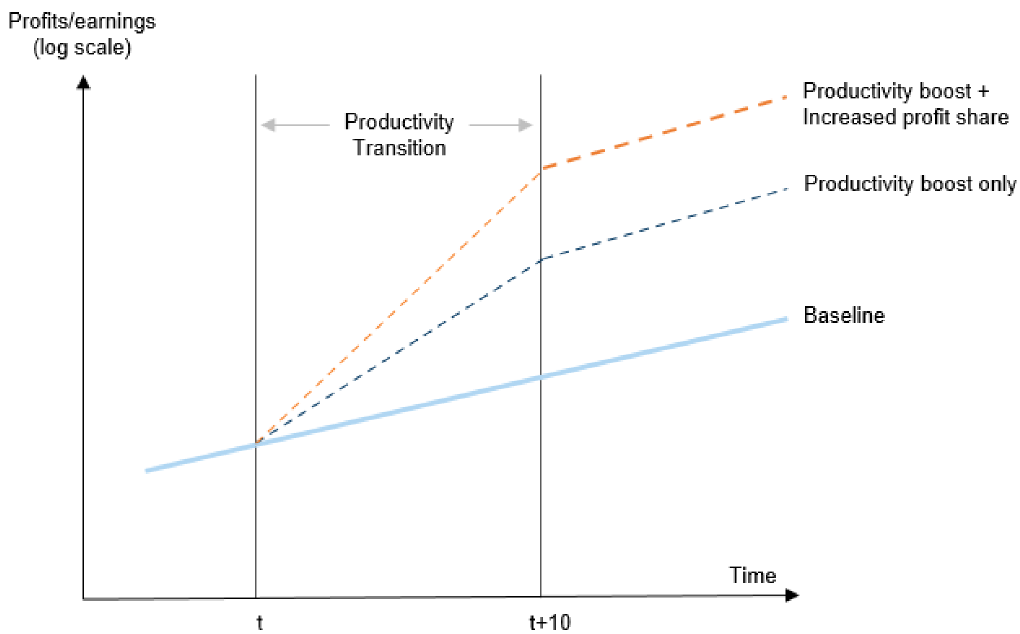
We laid out a simple version of that approach early in the AI boom, based on our estimates that AI could boost US productivity by around 1.5ppt for a 10-year period. If workers are not permanently displaced, the main impact would ultimately be to move the level of US GDP around 15% higher than it would otherwise have been. If the share of profits in the economy is stable, the path of earnings will look similar, with the level of earnings permanently also around 15% higher beyond that transitional period. The value of the equity market should ultimately increase by the discounted value of those additional profits. Because of the transitional period, that would be less than the 15% increase in the long-run level of GDP and earnings. Equities could only rise more than this on a fundamental basis if either the discount rate was to fall or the share of profits in the economy were to rise.

Exhibit 1: Markets should value a permanently higher level of earnings from a productivity boost



Source: Goldman Sachs Global Investment Research

Our global economics team recently set out a more sophisticated version of this basic calculation, estimating the Present Discounted Value (PDV) of future AI capital revenues from the same AI-induced productivity gains. Their baseline estimate is that $8tn of capital revenues could flow to US companies from generative AI. But there is inherent uncertainty around these estimates and this approach gives a plausible range of $5-19tn under alternative scenarios, which include varying the discount rate and capital share. Because these amounts comfortably exceed projections of AI-related capex, they suggest that current and anticipated overall total levels of AI capex are more than justified.

The question of whether current spending is justified is distinct from whether markets have already built those potential benefits into current equity valuations. As Exhibit 2 shows, since ChatGPT was introduced in November 2022, the value of the S&P 500 has increased by around $24tn. A broad list of public companies expected to benefit from the AI boom accounts for around $18tn over that period, much of it in the semiconductor space and the “hyperscalers”. Including almost $1tn for the latest

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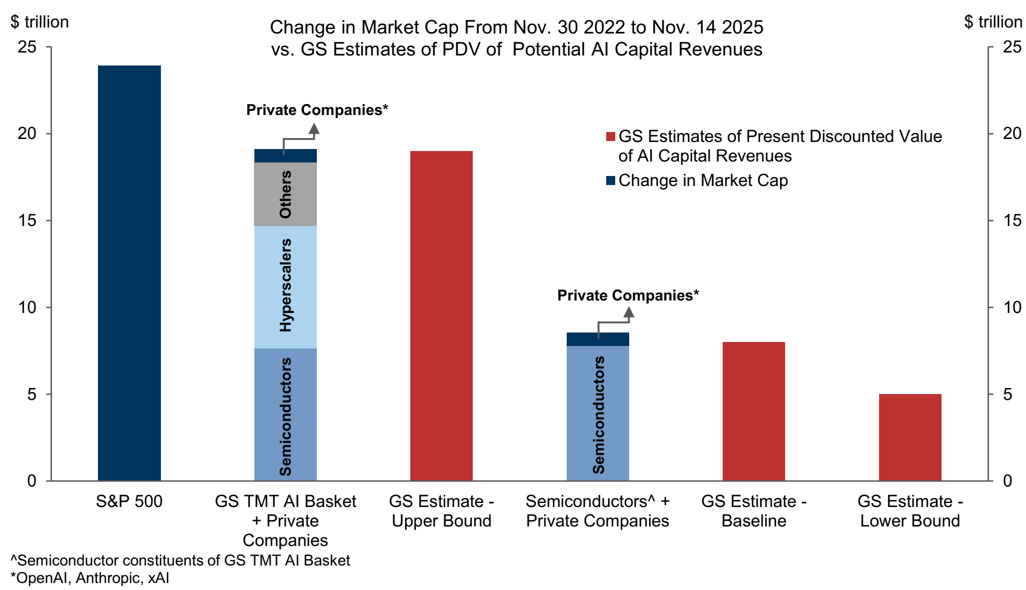
valuations of the three largest private AI model providers takes the total to around $19tn, at the upper limit of the projected macro benefits.

Those broad totals are an overstatement of the valuation gains from AI alone. Late 2022 was close to the Fed-induced low in US equities and non-AI companies have risen in value over this period too. And many of the companies—particularly the large tech conglomerates—are involved in a large range of businesses. But the change in value in AI-related companies in the semiconductor space and the private AI model providers, which are more plausibly attributable to the AI boom alone, already exceed the $8tn baseline estimate of increased capital revenues. And it is likely that a sizable portion of the valuation gains in many other AI-related companies over that period, including the hyper-scalers, is AI-driven.

Exhibit 2: Significant benefits already built into value of AI-related companies



Source: Bloomberg, FactSet, Goldman Sachs Global Investment Research

The $8tn estimate of potential increased capital value from AI's productivity benefits could certainly be too low. An unusually high share of AI-driven productivity gains might accrue to capital. And with US companies positioned as market leaders in AI, they may well be able to capture significant parts of the productivity gains outside the US, which may be at least as large in total. But productivity gains from AI may be offset in part by lower investment in other technologies. And it is also very unlikely that all the benefits in capital revenues from the AI productivity boom accrue to companies directly involved in AI, rather than potential users in other industries or new companies. So only a portion of the total capital revenues from the AI productivity boost should probably be built into the market value of AI-related companies.

These simple calculations suggest that the market may already have built in a significant amount of the potential value from AI up front, largely in those companies directly involved in or adjacent to the AI boom itself. This is a feature, not a bug, for forward-looking markets. Markets should price those gains ahead of time if they anticipate them, in advance of the spending that they justify. But it supports our observation that the valuation picture is further advanced than the macro story.

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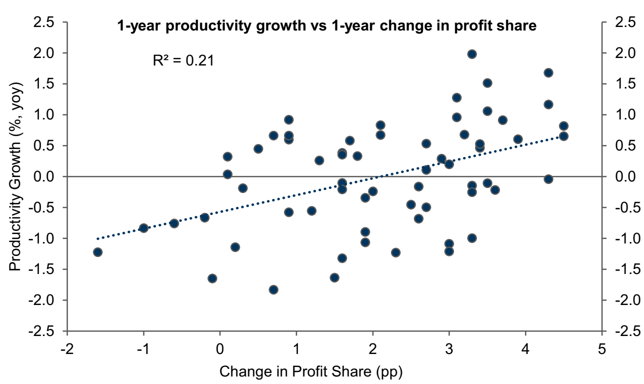
Just because we have built in significant valuation gains already does not mean that we cannot build in more. That is true even if the ultimate benefits are at the lower end of our estimated ranges. It can be challenging for markets to value periods of sustained productivity improvement, since they provide fundamental support for higher asset prices even if that improvement is then too widely or too highly priced. Past innovation-driven booms—like the 1920s and in the 1990s—have led the market to overpay for future profits even though the underlying innovations were real.

Two dynamics particularly can reinforce the tendency to overpay.

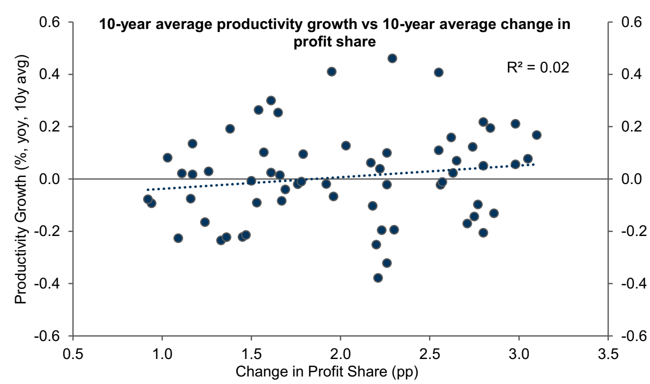
1. First, investors may fall prey to a *fallacy of aggregation*. Individual companies may be capable of stunning earnings growth for periods of time. But what is true for a single company may not be true on aggregate. Investors may price in a chance of increased profitability across a range of potential winners. If that process is too broad, they may imply excessive aggregate revenue and profit gains. The risk is that the joint value ascribed to chip designers and producers, model-builders and hyperscalers may exceed what they can ultimately all capture together.
2. Second, investors may fall prey to a *fallacy of extrapolation*. In the short term, accelerating productivity growth can lead to an increase in profit shares even at an economy-wide level. But on average, competition or investment often erodes those initial gains over subsequent years. So faster profit growth at the start of periods of innovation may be "paid back" over time. Activity fueled by the boom itself may also justify optimism for a while, as increased demand provides a boost to the profitability of companies supplying those areas that is also transitory. Markets may overestimate the earnings growth path if they treat these as persistent. Outside of hardware, current profits from AI are limited, so extrapolation risk may apply less to over-extrapolation of earnings growth and instead more to over-extrapolation of user or revenue growth.

Exhibit 3: Higher productivity growth is correlated with increased profit shares in the short term...



Source: Haver Analytics, Goldman Sachs Global Investment Research

Exhibit 4: ...but this relationship is much weaker over longer time periods



Source: Haver Analytics, Goldman Sachs Global Investment Research

The potential AI productivity boom we are describing does share some key features that have led to these issues in the past: a breakthrough discovery that might lead to sizable increases in productivity and profitability; creates the basis for substantial new investments; and fuels belief in a broader cycle of innovation.

At a macro level, we have shown that the tendency to pay the price for high valuations occurs disproportionately when the cycle turns. So as long as both the economy and the AI investment boom remain on track, we think markets are more likely to continue to take a more optimistic view. But the simple arithmetic here supports our view that market pricing is well ahead of the macro impact.

Dominic Wilson

Vickie Chang

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