

# Background Analysis 1.1.

## Rising Leverage in the AI Ecosystem

### Overview

- **AI-related investment has become an important source of support for the economy and financial markets.** Strong earnings growth among firms at the center of the AI value chain has supported asset prices and broader economic activity, leaving macrofinancial resilience increasingly dependent on expectations of rapid AI investment and earnings growth.
- **Leverage through corporate debt issuance has risen sharply as AI investment surges.** Dwindling free cash flow has pushed hyperscalers to rely increasingly on debt financing, lifting their share of global investment-grade bond issuance and outstandings to the highest level in recent years. A slowdown in AI investment or weaker-than-expected monetization could lead to mounting financing pressures.
- **Leverage in equity markets has increased notably amid investors ramping up demand for higher exposure to the AI theme.** Leveraged exchange-traded funds, margin borrowing, and hedge funds' equity exposures have all expanded, while the cost of financing equity positions has risen markedly, making sustaining leverage more difficult.
- **The rise in leverage in the AI ecosystem could exacerbate risks of a sudden reassessment of investor sentiment.** If AI-related earnings expectations weaken and investment slows, deleveraging by investors could amplify declines in asset prices and lead to tighter financial conditions.

### Key Questions

AI-related investments have become an important source of support for the real economy and financial markets. Realized and projected capital expenditures (capex) have created large earnings expectations among technology firms, especially those directly involved in the AI ecosystem, and have supported global equities since the April 2026 *Global Financial Stability Report* despite notable declines in forward price-to-earnings ratios (Figure 1.1.1, panel 1). As a result, technology firms account for a growing share of market capitalization across equity indices. The dominance of AI in equity markets has broadened beyond the United States to other regions integrated into the AI value chain. Therefore, the trajectory of AI investments will affect global financial conditions.

This background analysis examines the growing use of leverage in the AI ecosystem, through (1) debt issuance by hyperscalers and other large AI firms and (2) leverage used by investors to gain exposures to AI-related equities. Amid a surge in AI capex, investors may begin to question whether future monetization can generate returns above the cost of capital. The rapid emergence of lower-cost open-source AI models, such as Moonshot AI's Kimi models, could intensify competition and compress margins, undermining the profitability outlook for hyperscalers, semiconductor firms, and other AI-linked companies. Higher interest rates are another potential trigger.<sup>1</sup> A reassessment of these prospects could reverse investor sentiment and call into question the rationale for large-scale AI investment, repricing AI-related assets to account for increased difficulty in servicing debt. Deleveraging by investors—notably in equity markets—could amplify this repricing.

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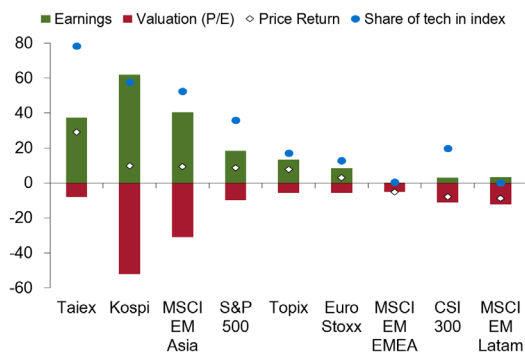
<sup>1</sup> Higher interest rates could raise the cost of capital and lower the valuation of future earnings streams.

### Figure 1.1.1. Equities and AI-Related Capex

*Strong expected earnings have supported equity returns in markets with higher tech and AI-related exposure, offsetting declining valuation multiples.*

#### 1. Price Return Decomposition of Selected Indices

(Percent, change since April 2026 *Global Financial Stability Report*; share of index)



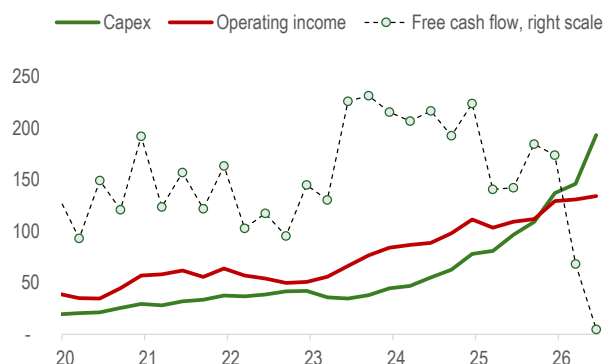
Sources: Bloomberg Finance L.P.; LSEG DataStream; and IMF staff calculations.

Note: Earnings contribution is the percent change in 12-month forward earnings per share. The estimates exclude one-off items, such as increases in the valuation of AI-related holdings, but include only recurring earnings. Price return is percent change from April 16, 2026 to September 30, 2026. Share of tech in index is the percentage of total GICS level 1 information technology market capitalization over the index market capitalization. P/E = price-to-earnings ratio.

*With dwindling free cash flows, hyperscalers need other sources of financing to support surging capex.*

#### 2. Capital Expenditure and Free Cash Flow at Five Hyperscalers

(Billions of US dollars)



Sources: Bloomberg Finance L.P.; LSEG DataStream; and IMF staff calculations. Note: The five hyperscalers are Alphabet, Amazon, Meta, Microsoft, and Oracle.

## Financial Stability Implications

### Accelerating Debt issuance by AI Firms Could Challenge Sustainability of Future Earnings

Hyperscalers are finding it harder to finance surging capex with operating income, leading to a shift toward debt financing to fund ongoing AI infrastructure buildout. Their free cash flow—the difference between operating income and capex—has dwindled given the surge in capex (Figure 1.1.1, panel 2).<sup>2</sup> As a result, hyperscalers, which have accounted for the bulk of capex within the AI value chain, are issuing debt at a substantial pace, lifting their share to almost 10 percent in total investment-grade (IG) corporate issuance thus far in 2026, compared with just 0.5 percent in 2024 (Figure 1.1.2, panel 1).<sup>3</sup> The share of large AI-related bond issuers has risen rapidly and may be approaching market absorption limits. Such limits can be viewed as a soft ceiling up to which additional issuance can be absorbed without materially affecting spreads; beyond this point, weakening

<sup>2</sup> While hyperscalers continue to maintain strong balance sheets and ample liquidity buffers, their free cash flow has come under pressure amid the sharp rise in AI-related capital expenditures. Against this backdrop, funding needs may increase materially over time, reflecting continued investment demands arising from intensifying competitive pressures and technological obsolescence (see April 2026 *Global Financial Stability Report*), alongside the eventual realization of sizable off-balance-sheet commitments. Although interest coverage ratios remain at comfortable levels, interest expenses in the second quarter of 2026 were more than twice as high as in the year earlier, totaling nearly \$6 billion across the five hyperscalers (Alphabet, Amazon, Meta, Microsoft, and Oracle).

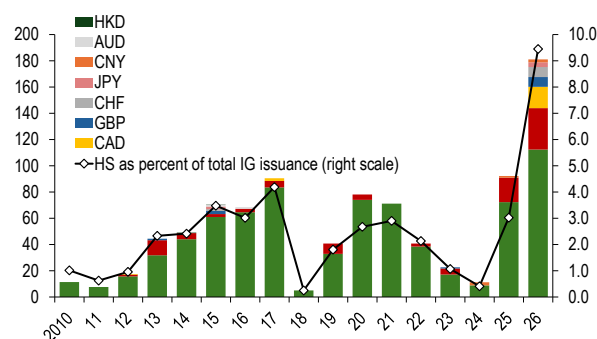
<sup>3</sup> Beyond debt, equity has reentered the funding mix. Alphabet priced an equity raise of about \$85 billion in June 2026, and Oracle announced a calendar-2026 plan to raise \$45 to \$50 billion of gross proceeds, approximately half through common and equity-linked instruments, including mandatory convertible preferred securities and an at-the-market program of up to \$20 billion. At the market level, the combination of a record AI-related listing pipeline, expiring lockups, and moderating repurchases is expected to turn net US equity issuance positive in 2026, the first such year since 2021 (on the basis of IMF staff estimates). Flow-of-funds data are consistent with this: net equity issuance swung from an annualized -\$216 billion in the fourth quarter of 2025 to +\$124 billion in the first quarter of 2026.

benchmark-driven demand may lead to wider spreads and higher funding costs.<sup>4</sup> These limits could be tested because debt issuance is likely to remain strong—hyperscalers' capex is projected to grow by about 20 percent to around \$1 trillion in 2027.<sup>5</sup>

**Figure 1.1.2. Hyperscaler Debt Issuance**

*On a flow basis, recent debt issuance by hyperscalers has significantly increased their share of total IG issuance.*

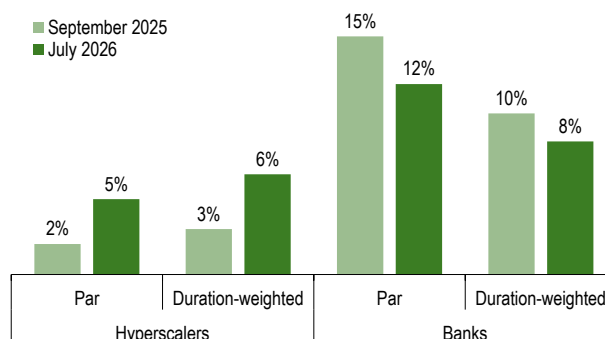
**1. Issuance by Hyperscalers by Currency, and Their Share in Global IG Issuances**  
(Billions of US dollars, left scale; percent, right scale)



Sources: Bloomberg Finance L.P.; Dealogic; and IMF staff calculations.  
Note: Data labels in the figure use International Organization for Standardization (ISO) currency codes. HS = hyperscaler; IG = investment grade.

*On a stock basis, the share of hyperscalers in IG bond index is approaching that of banks on a duration-weighted basis.*

**2. Share of Hyperscalers in Corporate IG Bond Index**  
(Percent)



Sources: Bloomberg Finance L.P.; Dealogic; and IMF staff calculations.  
Note: Shares are of Bloomberg US Corporate IG Bond Index. IG = investment grade.

Higher debt financing renders hyperscalers' balance sheets more sensitive to changes in interest rates. Higher funding rates due to widening credit spreads or policy-rate tightening are unlikely to affect the cost of outstanding debt materially given the relatively long weighted-average maturities as of now. However, the cost of new issuances could rise as capex deployment continues, potentially absorbing a growing share of revenue, weighing on earnings and profitability. Evidence of growing investors' concerns about durability of earnings is reflected in hyperscalers' credit spreads, which have widened since the April 2026 *Global Financial Stability Report* by about 30 basis points more than the broader IG index.

The scale of AI-related debt has risen substantially and could increase spillovers to broader credit markets. Hyperscaler issuance<sup>6</sup> now accounts for nearly 10 percent of global IG corporate bond issuance (Figure 1.1.2, panel 1), underscoring the rapid expansion of hyperscalers' footprint in credit markets.<sup>7</sup> Moreover, rising concentration of hyperscalers in benchmark IG indices could result in greater influence over broader credit pricing. In particular, over the past year, the share of par outstanding hyperscalers' bonds in the IG index rose by over 3 percentage points to close to 5 percent; on a duration-adjusted basis, their share has risen to more than 6 percent, approaching that of banks, which have historically been the dominant sector for IG bonds (Figure 1.1.2, panel 2). Given increasing benchmark concentration, a spread widening for hyperscalers could trigger mechanical portfolio rebalancing by investors amid concentration limits, potentially spilling into the

<sup>4</sup> Goldman Sachs (2026) argues that the US banks—currently the largest issuers in the Bloomberg USD IG Corporate Index—are a case study to frame hyperscalers' potential market absorption limits. As of July 2026, the share of largest US banks in global corporate IG index ranges between 1.1 to 1.4 percent. The largest bond issuing hyperscalers are rapidly catching up with banks as their share in the global corporate IG index has risen from 0.1 to 0.33 percent a year ago to 0.2–0.8 percent in July 2026.

<sup>5</sup> Projected capex growth is based on the consensus estimates submitted by analysts to Bloomberg Finance L.P. as of July 31, 2026.

<sup>6</sup> Covering the key currencies in which hyperscalers have been issuing, that is, the US dollar, the euro, and the British pound.

<sup>7</sup> In the first quarter of 2026, investment-grade corporate bond issuance continued to rise, accounting for 40, current projection percent of advanced economy (euro area, United Kingdom, and United States) bond issuance—including sovereign debt—on a duration-adjusted basis.

broader credit market through index-tracking portfolios and exchange-traded bond funds.<sup>8</sup>

## Leverage in Equity Markets Has Increased Notably, Fueled by Investors Ramping Up Demand for AI-Related Exposure

The recent rise in equity markets has been underpinned by mounting use of leverage by investors seeking greater exposure to AI equities.<sup>9</sup> Higher leveraged exposure could be a significant vulnerability in a scenario of a deceleration in investment and material reassessment of AI firms' future profitability. A slowdown in earnings growth would trigger asset price declines even if price-to-earnings multiples remain unchanged, because equity prices would decline, mechanically forcing unwinding of levered positions, amplifying the downturn.

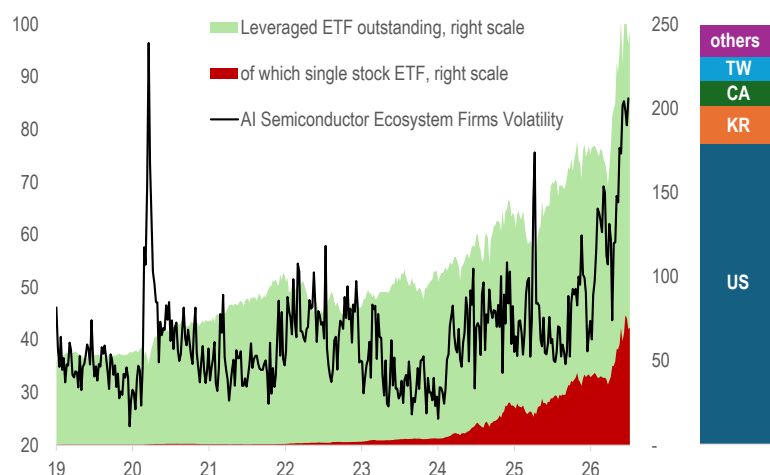
Demand for leverage has been climbing across hedge funds, leveraged exchange-traded funds (ETFs), and equity derivatives in pursuit of higher returns.<sup>10</sup> Global equity leveraged ETF assets outstanding have grown sharply, rising by around 56 percent since the end of 2025. North America and East Asia currently account for more than 95 percent of the total (Figure 1.1.3).

Drivers vary by region. In the United States, growth in semiconductor leveraged ETFs has been largely flow driven, whereas index-linked products have expanded mainly through valuation gains. In Korea, the late-May launch of 2x single-stock leveraged ETFs on Samsung Electronics and SK Hynix<sup>11</sup> triggered a surge led by retail investors, redirecting their overseas investments back to these

**Figure 1.1.3. Global Leveraged ETFs and Regional Share**

(Percent; billions of US dollars, left scale; regional distribution, right scale)

*Rapid growth in leveraged ETFs has heightened risks of market volatility amplification from daily rebalancing flows.*



Sources: Bloomberg Finance L.P.; and IMF staff estimates.

Note: Leveraged exchange-traded fund (ETF) data are obtained by filtering the Bloomberg Finance L.P. ETF universe. Leveraged products include inverse funds. Assets under management are reported on a nominal basis and do not adjust for leveraged exposure. Definitions of the product universe vary across data sources and rely on staff estimates. Data labels in the figure use International Organization for Standardization (ISO) country codes. AI semiconductor firms' volatility is the simple average of one-month option-implied volatility for the following firms: AMD (US), ASML (NL), Broadcom (US), MediaTek (TW), Micron Technology (US), and SK Hynix (KR).

<sup>8</sup> Spread widening often comes in tandem with a rise in market volatility. Higher volatility can tighten value-at-risk constraints and other risk-management limits, prompting deleveraging and position reductions by leveraged investors. Such adjustments may, in turn, lead to additional asset sales, lower market liquidity, and further spread widening, thus amplifying adverse market dynamics (see, for example, Adrian and Shin 2014).

<sup>9</sup> As illustrated by the rapid growth of single-name leveraged ETFs, rising leverage in equity markets has coincided with an increasing concentration of investor exposures in a narrow group of AI-related stocks. More broadly, concentration in major global equity indices is at historically elevated levels, as a small group of AI firms commands an outsized and rising share of market capitalization (see the April 2026 *Global Financial Stability Report*). A reversal in sentiment regarding the AI theme could therefore trigger losses extending well beyond these individual stocks through broader benchmark indices. With household exposure to equity markets also at historical highs, a significant correction could materially reduce household wealth, weighing on consumption and real activity.

<sup>10</sup> Beyond them, activity is also building in nontraditional, on-chain synthetic asset markets, most notably perpetual futures. Round-the-clock, oracle-referenced equity perpetuums have begun to host price discovery outside cash-market hours, embedding after-hours information into a reference price that can spill back as opening gaps in the underlying. Yet with no maturity to anchor convergence, thin underlying liquidity and embedded leverage can amplify small order-flow shocks into outsized price moves and forced liquidations. These dynamics echo the early evidence on tokenized equities in Chapter 3, where continuous, on-chain price discovery outside conventional hours coexists with greater volatility, lower liquidity, and fragmentation.

<sup>11</sup> Together, Samsung Electronics and SK Hynix accounted for more than half of the KOSPI's total market capitalization at the peak, with demand for single-stock leveraged ETFs concentrated overwhelmingly in these two names.

domestic stocks. These 2x funds rapidly gained traction, with retail investors reportedly holding as much as about 90 percent of outstanding positions.<sup>12</sup>

Growing use of leveraged ETFs could potentially raise the likelihood of volatility amplification if sentiment were to suddenly shift. This is consistent with the behavior of portfolio flows in Korea having become markedly more volatile over the past several months, with estimated leveraged ETF rebalancing amounts also increasing during periods of elevated market volatility. Volatility amplification arising from various factors, such as high concentration in the semiconductor sector, global semiconductor market conditions, foreign investors' portfolio rebalancing pressures, along with daily rebalancing of leveraged ETFs, has resulted in the KOSPI's marketwide circuit breaker being activated nine times in 2026 through the end of July (Hai-woon 2026).<sup>13</sup> The two earlier activations this year occurred amid the global sell-off in March. The increase in frequency of activations this year stands in contrast to just six activations being recorded over the preceding 26 years.<sup>14</sup>

Hedge funds have also steadily increased their gross equity exposure, particularly to AI-related equities. A growing share is obtained synthetically through swaps and other derivative structures, resulting in a substantial rise in equity derivatives and repos in addition to margin lending. Across major advanced economy equity markets, margin loans and hedge funds' gross equity exposure has grown from 10 to almost 15 percent of advanced economy GDP since the end of 2024. Over that same period, index options—one method to gain embedded leverage exposures in US equity—have seen a growth in notional amount from 5 to almost 11 percent (Figure 1.1.4, panel 1).

As leverage in equity markets grows, costs of leverage have also risen, making it potentially difficult to sustain. Without direct observations on the financing rates of margin loans, equity repos, or prime brokerage, the proxy for cost of equity leverage can instead be implied from prices in option markets; the implied 30-day cost of financing a leveraged S&P 500 position over the secured overnight funding rate nearly doubled since early 2026 and more than quintupled since the end of 2024 (Figure 1.1.4, panel 2). These costs have been pushed up by the demand for leverage, higher valuations, and dealers' balance sheet constraints.<sup>15</sup> Nonprice terms that dealers demand, such as initial margins or haircuts, have also tightened, anecdotally. Looking ahead, further increases in AI equity prices could push financing costs even higher and terms even tighter. Investors wishing to roll over or add to leveraged exposures will have to pay successively more, while sustaining leveraged position will require continued robust sentiment on AI. A reversal of sentiment could trigger amplified equity price declines and tighten broader financial conditions.

<sup>12</sup> Crypto Briefing (2026) reported that “retail traders accounted for about 92 percent of total holdings.” See also Seoul Shinmun (July 12, 2026), noting that roughly 85 percent of investors holding these products overnight were individuals.

<sup>13</sup> Seven of the nine have occurred after the single-stock leveraged ETFs were listed in late May 2026. Amid the rapid expansion of single-stock leveraged products and concerns that their trading and daily rebalancing could further amplify volatility in major semiconductor stocks, Korean authorities announced tighter measures on July 16. These included an immediate temporary suspension of new listings of single-stock products and an increase in the minimum cash deposit for retail investors from 10 million won to 30 million won, with the latter taking effect on July 31.

<sup>14</sup> Korea Exchange (KRX) data. The KOSPI's marketwide circuit breaker was triggered nine times in 2026 through end-July, the highest annual count since the mechanism's introduction in April 2000 and the 15th activation in its history (with six activations over 2000–25). See Hai-woon (2026) and Seoul Economic Daily / Korea Exchange releases (July 2026).

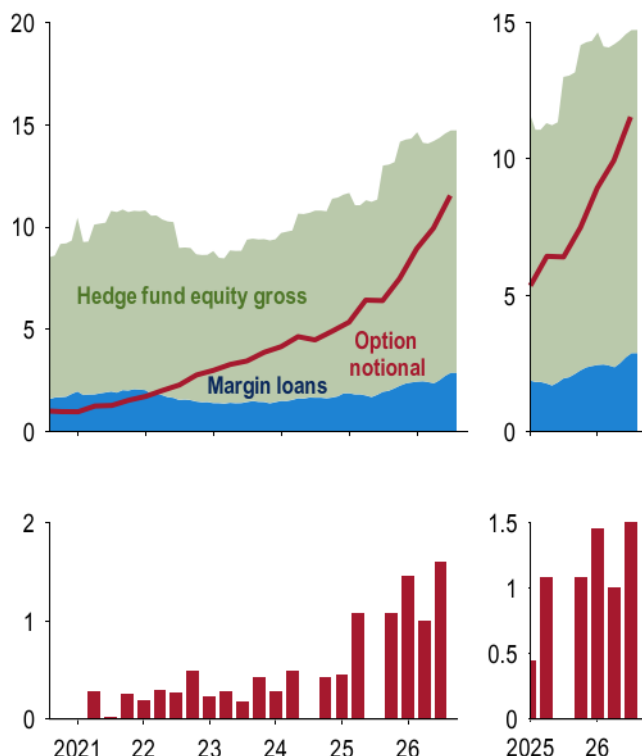
<sup>15</sup> Over the past few years, bank-dealers' equity prime brokerage businesses have risen markedly, driven in part by a more than twofold increase in total return swap exposures, growing securities lending and derivatives activity associated with hedge funds' expanding equity positions. Leveraged investment vehicles like exchange-traded funds or exchange-traded products also use swaps written by bank-dealers to gain exposures as their assets under management grew (see April 2026 *Global Financial Stability Report*). All these activities have increased dealers' balance sheet usage, likely leading to more binding regulatory capital and leverage ratios.

**Figure 1.1.4. Quantity and Price of Equity Leverage**

*The volume of equity leverage has climbed to about 15 percent of advanced economy GDP.*

### 1. Volume of Global Equity Leverage

(Percent of advanced economy GDP;  
percent of US GDP)



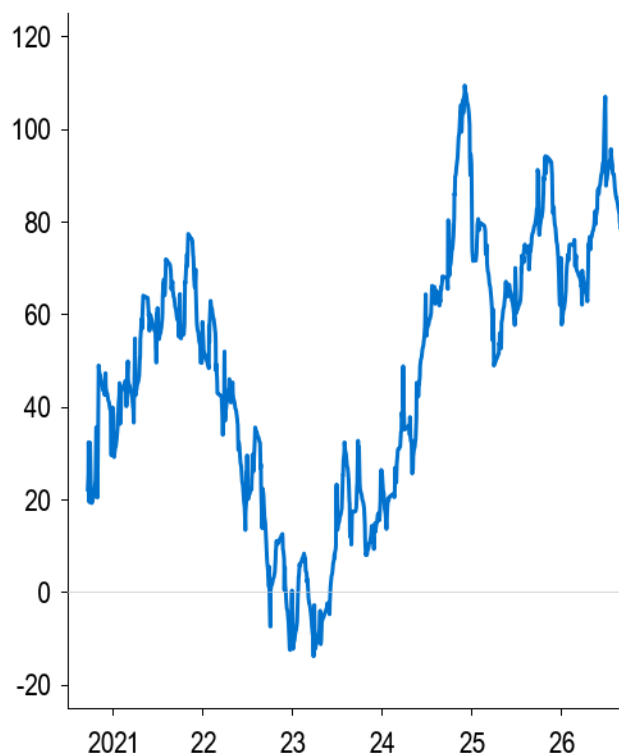
Sources: Bank for International Settlements; Federal Reserve Bank of New York; FINRA; Japan Exchange Group; KOFIA; London Stock Exchange Group; OFR; OptionMetrics; Shanghai and Shenzhen Stock Exchanges; Thomson Reuters; IMF, World Economic Outlook database; and IMF staff calculations.

Note: The top of Panel 1 shows margin loans (United States, Japan, China, Korea; in US dollars) plus global qualifying hedge funds' gross notional equity exposure, as a percent of advanced-economy nominal GDP (left axis). The red line is delta-adjusted notional values across listed US index options, as a percent of US nominal GDP (right axis). The bottom ribbon red bars show the quarterly change of the US equity index option notional in percentage points of nominal US GDP. The inset zooms the recent window, from the fourth quarter of 2024 to the second quarter of 2026 owing to regulatory and exchange-filing lags in the underlying series.

*Funding cost for leveraged equity exposure has nearly doubled since early 2026.*

### 2. Proxy Cost of Equity Leverage

(Basis points)



Sources: Bloomberg Finance L.P.; OptionMetrics; and IMF staff calculations.

Note: Panel shows estimates of the 30-day equity financing spread over the secured overnight funding rate, implied from the financing rate in put-call parity relationships in equity option markets. This proxy measure closely tracks CME's S&P 500 Adjusted Interest Rate Total Return futures.

## Conclusion and Policy Recommendations

AI-related investment has become a key support for economic activity and financial markets, but its growth is increasingly intertwined with rising leverage across both corporate balance sheets and equity markets. As hyperscalers (and other AI firms) rely more heavily on debt issuance and investors on leverage to gain exposure to the AI-related equities, a disappointment in AI monetization and a slowdown in AI investments could be amplified into a market correction through deleveraging and lead to a broader tightening of financial conditions. Staff analysis conducted in this note points to the following policy recommendations:

- **Contain mechanical amplification in leveraged products.** The recent experience in Korea's equity market, where leveraged-ETF exposure has grown large relative to liquidity of the underlying, offers valuable lessons for other jurisdictions as well. Timely and proactive policy responses by the Korean authorities worked along

three dimensions: the product perimeter (a temporary halt on new listings of single-stock leveraged products); investor access (a higher minimum cash deposit and raising minimum trading unit); and execution (limiting mandates to qualified liquidity providers and dispersing rebalance pressures away from closing hours). Execution measures, in particular, deserve priority: product-perimeter and investor-access measures can slow the buildup of new inflows and positions but do little to contain abrupt mechanical rebalancing because of the large stock of outstanding positions. Measures pertaining to execution can serve to disperse pressure over time and mitigate immediate market impact. Before approving such products, authorities should weigh prospective rebalancing flows against the depth of the underlying.

- **Enhance the monitoring of hedge funds' use of leverage, especially synthetic means.** A growing share of hedge fund equity exposure is synthetic, obtained through swaps that no single reporting framework fully captures. Granular reporting of gross synthetic exposure and dealer intermediated financing would allow authorities to assess leverage buildup in a timely manner.
- Assess the potential for systemwide losses arising from AI-related exposures, including the risk that highly interconnected and circular financing arrangements amplify distress. Where vulnerabilities could be material, authorities should deploy appropriate tools, including sectoral capital requirements, concentration limits, and capital buffers, to contain the buildup of systemic risk and strengthen financial resilience.

## References

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