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Humanoid Robot

Global robotics race accelerating: What we learned from our Beijing tour, robotics webinar, Tesla event and M+ Forum

The past month has marked a pivotal phase for the humanoid robotics sector, with a series of high-profile events and rapid developments underscoring the industry's transition from concept to scaled deployment. The Beijing robotics and auto tour, held jointly with the auto show over 22-24 April, provided a first-hand look at the latest pilot deployments and commercialization progress among China's Beijing-based leading OEMs and component suppliers. The J.P. Morgan Robotics Opportunities webinar on 16 April drew very high attendance from global investors and industry participants, reflecting the sector's growing relevance and the breadth of interest across Asia and the US. The session highlighted the acceleration of humanoid and industrial robotics adoption, the convergence of high-precision hardware and real-time AI, and the emergence of new business models around data, software and recurring services. The M+ Forum in Malaysia, hosted by Yen Voo on 21-22 April, featured a panel with Work E Robotics (Unitree's authorized Malaysia partner) and provided valuable insights into early commercial adoption and evolving business models in ASEAN, with particular focus on operational resilience and solution integration.

On the global stage, Tesla's \$25B capital allocation for AI, robotics and chipmaking is a clear signal of its ambition to become a physical AI company, with the Optimus humanoid robot program at the center of its long-term strategy. The company (covered by the Head of J.P. Morgan's U.S. Autos & Auto Parts team, Ryan Brinkman) is preparing to launch Optimus production in Fremont this summer, with a second factory in Texas planned for 2027, but we see it as playing catch-up to faster-moving Chinese rivals and Boston Dynamics, which is preparing to ship Atlas robots for Hyundai's industrial use. While Tesla's core EV business faces intensifying competition and margin pressure, the company is keenly focused on AI and robotics, investing heavily in proprietary chips and vertically integrated manufacturing. Meanwhile, China's leading OEMs are moving rapidly from pilot to scaled deployment, leveraging strong government support, a robust supply chain and aggressive iteration in both hardware and AI. Boston Dynamics, under Hyundai, is leveraging its legacy in motion control and industrial integration to target high-value, mission-critical applications, but faces pressure from lower-cost, faster-scaling Chinese OEMs. The US market remains in the early stages of humanoid adoption, but automation density is rising and the supply chain is diversifying, with actuation and motion components representing a multi-billion-dollar TAM, in our view.

Stock view: We remain constructive on the sector's long-term opportunity, but see a widening gap between "winners" and "long-tail" players. Investors are increasingly focused on evidence of real-world scale, recurring orders and the ability to move beyond pilot projects to sustainable, high-margin business models. Capital is concentrating in profitable, scale-ready platforms and in suppliers of high-quality components and "brains" (AI/software). We see Leader Drive, Sanhua Intelligent, Minth, Hengli Hydraulic, UBTECH and Hyundai Motor as well positioned to capture the next leg of growth. The market is rewarding

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companies with strong commercialization momentum, robust order books and differentiated technology, while laggards and smaller OEMs face tougher funding and competitive environments. The sector's upcycle, driven by automation, AI and robotics, remains firmly in place for 2026 and beyond, with the rapid expansion of use cases and the scale-up of production likely to drive margin improvement and sector re-rating as adoption accelerates, in our view.

Key takeaways from Beijing robotics and auto tour (22-24 April) highlight rapid shift from POC to scaled pilots and centrality of deployment readiness

The Beijing robotics and auto tour, held in conjunction with the auto show over 22-24 April, was well attended by both investors and industry participants, reflecting the high level of market interest in China's humanoid and automation ecosystem. The itinerary included site visits and management meetings with a range of leading robotics and automation companies, as well as key component suppliers specializing in dexterous hands and actuators. The tour provided a first-hand look at the latest pilot deployments and commercialization progress, with a notably more commercial atmosphere than in previous years. Customers and partners were focused on scaling pilots and moving toward real-world usage, underscoring the sector's transition from concept to practical deployment.

- **The near-term outlook for 2026 points to a much faster conversion from proof-of-concept (POC) to scaled pilot deployments, especially in logistics and manufacturing scenarios that are relatively structured.** The most visible ramp drivers are sorting and warehouse workflows, where flexibility is needed for non-standard orders and assembly or loading/unloading tasks in repetitive, constrained manufacturing cells. Our discussions suggest that volume growth will be gated less by prototype capability and more by deployment readiness—reliability, maintenance, consistency and integration time are now the main bottlenecks. The “last-10cm” challenge—scaling from demo to robust, real-world use—remains central. A dexterous hand supplier we met expects its shipment volume to double again in 2026, building on over 10,000 units in 2025, which provides a useful baseline for how quickly commercial usage is moving from data collection and showroom demand into real deployments.
- **Physical intelligence development is now at the center of industry focus for 2026, as embodied AI advancement is the key bottleneck for real-world commercialization.** The “brains-first” strategy is increasingly the core axis of differentiation, with world foundation models and VLA (vision-language-action) models seen (by the companies we visited) as the most promising paths to the endgame for embodied AI. The VLA model is central to action execution—mapping language and video understanding to robot actions—while the world model is for reasoning, planning and “understanding” the environment. The simulation-to-real gap is a widely discussed challenge. One leading humanoid company we visited is using a “control world” tool and a data infrastructure layer to relieve real-scene data bottlenecks, especially for force, friction and tactile realism, arguing that learning efficiency and sim-to-real transfer will be the key unlocks for scaling beyond short-horizon tasks.
- **Commercial traction today is driven more by “solutions plus data collection” than by pure ROI-led labor replacement.** The most tangible humanoid deployments are in logistics sorting and structured manipulation, where customers are already running triple-digit pilots and asking for expansion.

At the same time, a meaningful slice of demand is from large tech and industrial customers using robots primarily to collect data to train their own models. For robot OEMs, this means commercialization models are evolving: Some are selling the “brain” bundled with the body, some are selling hardware only, and others are providing SDK/hardware-only options for customers that want to develop their own intelligence.

- **Dexterous hands remain the near-term bottleneck, and value is accruing to suppliers that can mass-produce with consistency under harsh conditions.** Hand component suppliers emphasized that the sector’s challenge has shifted from “can it work” to “can it scale” across temperature, vibration, corrosion and durability. As robot OEMs move from conceptual stage to mass production, and from showroom demand to real-world usage and data center build-outs, stability requirements are rising sharply, supporting repeat-order behavior once end use cases mature.
- **Capital-raising activity is likely to remain elevated into 2026, but with a widening gap between “winners” and “long-tail” funding access.** Our channel checks suggest early 2026 remains active for primary fundraising, with valuation levels being pushed up and a shift toward a more “capitalization” phase. However, capital is increasingly concentrated: Investors prefer to anchor in profitable, scale-ready platforms and selectively add positions in higher-quality components and “brains” exposure. Smaller OEMs may find it harder to raise, given the capex intensity of VLA-scale training, data acquisition and manufacturing ramp. This sets up a more selective funding environment and raises the probability of partnerships, consolidation and structured financing as the ecosystem matures.

Robotics webinar provided a sophisticated, cross-market perspective on evolving global humanoid and automation landscape

The Robotics Opportunities webinar, held on 16 April and attended by Karen Li, Tomohiko Sano and Sonny Lee, drew very high attendance from global investors and industry participants, underscoring the sector’s growing relevance and the breadth of interest across Asia and the US. The session focused on the rapid acceleration of humanoid and industrial robotics adoption, the convergence of high-precision hardware and real-time AI, and the emergence of new business models around data, software and recurring services.

- **The discussion highlighted that China’s humanoid robotics sector has moved from research and pilot projects to real-world deployment and mass production at an unprecedented pace.** Since late 2023 and especially through 2024, the market shifted from small-batch trials to genuine commercial orders, with leading OEMs now shipping thousands of units per year. The ecosystem is increasingly diverse, with players like Unitree, UBTECH and Agibot each leveraging different business models—ranging from open-source and vertically integrated to software-first and outsourcing-focused. The scale and seriousness of user cases have changed dramatically, with robots now deployed for repetitive manufacturing tasks, logistics and large-scale data collection for AI model training. Order drivers have also shifted, with government procurement and public sector projects now playing a central role, especially as local

governments set up data collection centers and pilot zones. This has resulted in a back-end-loaded order cycle and a major catalyst effect from the IPO pipeline.

- **The US market remains in the early stages of humanoid robot deployment, but is positioned for exponential growth** as automation density rises and applications broaden beyond traditional automotive and electronics into logistics, food and beverage, and construction. The US supply chain for humanoid robots is becoming more diversified, with actuation and motion components representing a multi-billion-dollar TAM by the next decade, in our view. US players are increasingly focused on integrating advanced vision, AI and flexible robotics to enable robots to handle more complex, non-standard tasks and adapt to dynamic environments.
- **A key theme was the shift from hardware-centric automation to integrated solutions that combine advanced vision, AI and flexible robotics.** The next wave of robotics is expected to be defined by the convergence of high-precision hardware, real-time AI control and scalable software platforms. The importance of IP leadership was also emphasized, with innovation increasingly coming not just from OEMs, but from end users and the supply chain, as evidenced by the sharp rise in patent activity and the emergence of new business models around data, software and recurring services.
- **The session also addressed Korea's growing role in the global robotics landscape, with particular attention to Boston Dynamics and its integration with Hyundai/Kia.** Boston Dynamics is preparing for broader industrial deployment of its Atlas humanoid robot, with initial applications expected in Hyundai's car plants starting in 2028. The company's focus remains on high-volume, repetitive tasks in structured environments, leveraging its legacy in motion control and technical innovation. Korea's robotics ecosystem is increasingly characterized by partnerships between global technology leaders and local industrial champions, with a strong emphasis on scaling production, expanding enterprise use cases and maintaining high standards for reliability and safety. The leadership transition at Boston Dynamics and Hyundai's significant investment in robotics and AI infrastructure were noted as key developments to watch as the competitive landscape continues to evolve.
- **The Q&A session surfaced several sophisticated challenges:** the need for robust deployment standards, the complexity of scaling from pilot to mass adoption, and the evolving regulatory landscape. Panelists noted that successful commercialization will depend on the ability to build data flywheels, continuously iterate AI models and deliver measurable improvements in productivity and flexibility. Investors are increasingly focused on evidence of real-world scale, recurring orders and the ability to move beyond pilot projects to sustainable, high-margin business models.

M+ forum in Malaysia provided valuable insights into Unitree's early commercial adoption and evolving business models in ASEAN

The M+ forum, held in Kuala Lumpur and hosted by Yen Voo and team, featured a panel session with Work E Robotics, the authorized Malaysia partner for Unitree. The event showcased Unitree's humanoid and quadruped robots and drew strong interest from local industry participants. The discussion highlighted that ASEAN industrial robotics is now transitioning from showcase and proof-of-

concept to early commercial deployment, with the adoption curve being benchmarked against the EV sector's trajectory five to seven years ago. Enterprise inquiries have increased in 2026, but the buyer mindset has shifted away from labor-cost arbitrage—less relevant in low-wage ASEAN—toward operational resilience, workforce consistency, 24/7 uptime and safety in hazardous environments.

- **The oil & gas sector has emerged as a leading source of demand, with the Unitree B2 quadruped (IP-rated, c.40kg payload on an 80kg chassis) being considered for high-risk tasks such as gas-leak detection and perimeter surveillance.** Manufacturing is seen as the next likely adopter, with the G1 humanoid (torso on AMR base) targeting plant logistics in controlled ground conditions. While interest is growing, deployments remain lumpy and dominated by proof-of-concept pilots; panelists noted that fleet-scale adoption will likely require another two to three years of solution maturity and further hardware cost declines.
- **Cost considerations are top-of-mind for adopters, with the expectation that hardware will eventually be commoditized as Chinese OEMs continue to drive down BOM costs.** Integration and deployment—such as site mapping and LLM/sensor stitching—are expected to become the main sources of margin and customer stickiness. Work E Robotics management was explicit that “once hardware becomes standard, the solution becomes the key.” Commercial models today are skewed toward outright purchase, but there is growing discussion of Robot-as-a-Service and subscription models, which could unlock broader mid-market adoption by converting capex to opex and lowering the barrier for enterprise customers.

Tesla's latest updates reinforce its strategic pivot toward AI and robotics, with capital allocation and operational focus shifting to Optimus and physical AI

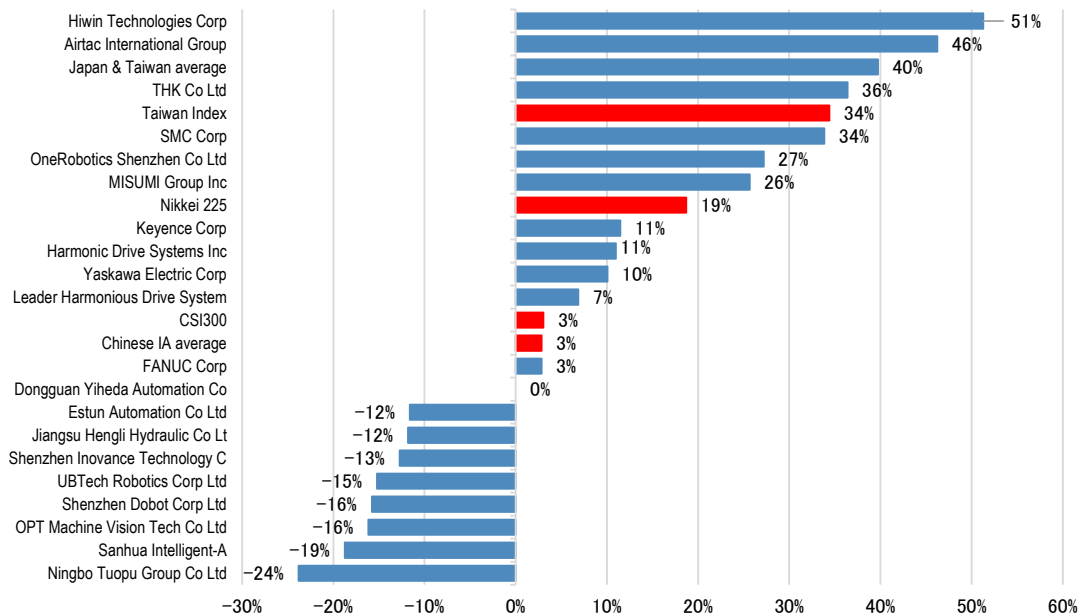
- **Tesla has made clear that its long-term vision is to become a physical AI and robotics company, with humanoid robots and autonomous mobility at the center of its growth strategy.** The company is substantially increasing its capital expenditure, with over \$25B planned for 2026, to accelerate the transformation of its Fremont facility into a large-scale robot factory and build out in-house chipmaking and AI infrastructure. We expect this investment to support the ramp-up of Optimus humanoid robot production, with the Fremont plant targeting a capacity of 1M units per year and a second factory in Texas planned for further scaling.
- **While Tesla's core EV business has faced headwinds from increased competition, a limited model lineup and margin pressure, the company is keenly focused on AI and robotics.** The Optimus program remains a strategic priority, with the V3 design nearly ready for production and initial ramp-up expected in the second half of 2026. Tesla is deliberately holding back on public demonstrations of Optimus 3 to protect its IP and maintain a competitive edge, given the intense scrutiny and rapid imitation from global competitors. The company's approach is to start with simple factory tasks and gradually expand Optimus's skillset, with the expectation that humanoid robots will become a major product line over time.

- **Tesla is also investing heavily in proprietary AI chips, with the AI5 chip set to power both Optimus and the company's data centers.** The company is building a vertically integrated chip fab to ensure supply chain security and enable rapid iteration in AI hardware. The broader strategy is to integrate AI, robotics and energy storage across all business lines, with the goal of building a global fleet of autonomous vehicles, robotaxis and humanoid robots. The company is preparing to expand its robotaxi service to additional cities, but regulatory approval and safety validation remain key hurdles.
- **Management has acknowledged that the initial production ramp for Optimus will be slow, given the complexity of building a new product and supply chain, but expects significant scaling in 2027 and beyond.** The company's battery business remains a key enabler, with ongoing investments in new cell chemistries and manufacturing capacity. Investors are increasingly focused on Tesla's AI and robotics initiatives as the main driver of the company's premium valuation, even as the core EV business faces intensifying competition and operational challenges.

Share price review: YTD and recent performance highlight regional divergence and selective rotation

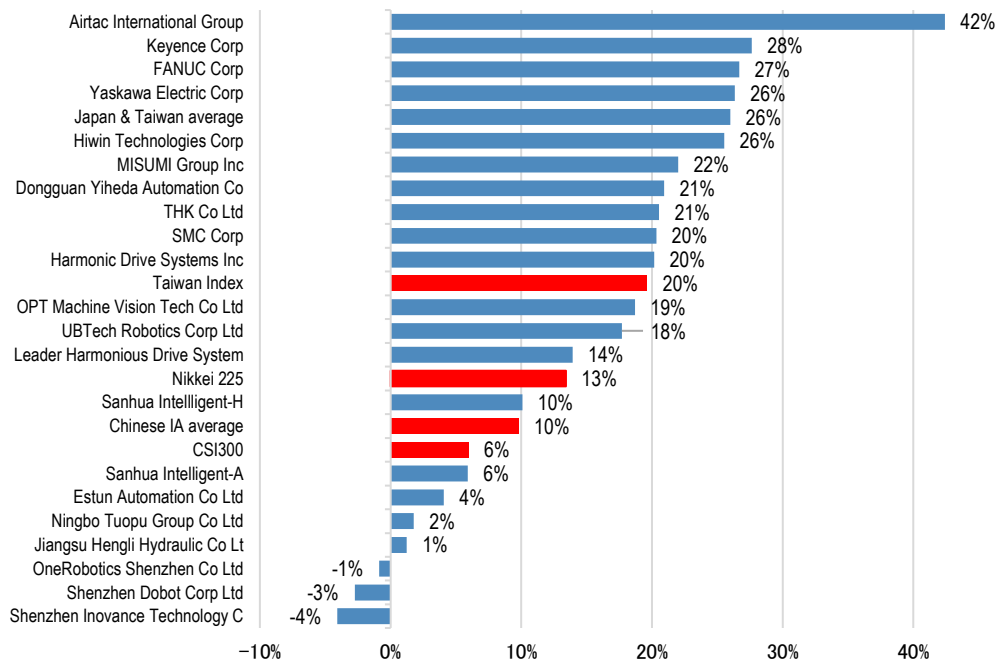
- **The YTD performance chart shows a stark divergence between Japan/Taiwan and China.** Hiwin Technologies (+51% YTD), AirTac (+46%) and THK (+36%) lead the pack, with the Japan and Taiwan average up 40%. By contrast, most Chinese names are flat to negative YTD, with Sanhua Intelligent-A down 19% and Ningbo Tuopu down 24%. The Chinese IA average is just +3%, lagging the global and regional benchmarks. This underperformance reflects both macro headwinds and investor skepticism about near-term commercialization, but also sets up a potential catch-up trade as fundamentals improve.
- **The one-month performance chart shows a more mixed picture, with some Chinese names rebounding.** AirTac (+42%), Keyence (+28%) and FANUC (+27%) remain strong, but UBTECH (+18%), Leader Drive (+14%) and Sanhua Intelligent-H (+10%) have also posted notable gains. The Chinese IA average is +10% for the month, suggesting that capital is rotating back into select robotics and automation names as risk appetite returns. The market is increasingly selective, rewarding companies with clear commercialization progress, strong order momentum and differentiated technology, while laggards continue to underperform.

Figure 1: Asian factory automation and humanoid robot share price performance YTD



Source: Bloomberg Finance L.P. Priced as of 27 April 2026. Note: Past results are not an indicator of future performance.

Figure 2: Asian factory automation and humanoid robot share price performance over the past month



Source: Bloomberg Finance L.P. Priced as of 27 April 2026. Note: Past results are not an indicator of future performance.

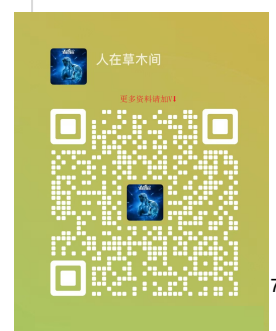


Table 1: Humanoid robot comps

Company	Stock code	JPM rtg	Share price (LC)	JPM PT (LC)	Up/down- side (%)	Mkt cap (US\$M)	Daily turnover (US\$M)	YTD price chg.	2025 price chg.	P/E (x) (FY26E)	ROE (%) (FY26E)	EPS growth (FY25E)	EPS growth (FY26E)	PEG (x) (2026E)
Leader Drive	688017 CH	OW	204	264	30	5,465	209	6%	78%	175	5.7	125%	64%	4.5
Sanhua-A	002050 CH	OW	45	60	33	26,479	718	-18%	135%	39	14.5	18%	19%	2.4
Sanhua-H	2050 HK	OW	30	42	40	26,479	58	-21%	70%	22	14.5	18%	19%	1.4
Ningbo Tuopu	601689 CH	UW	58	48	-17	14,739	256	-25%	58%	28	16.0	-9%	30%	1.2
Minth	425 HK	OW	35	60	72	5,215	32	10%	110%	10	12.6	20%	28%	0.4
Zhongda Leader	002896 CH	NC	71	NA	NA	2,044	63	-20%	202%	134	8.1	-13%	66%	3.4
Shuanhuan	002472 CH	NC	38	NA	NA	4,727	93	-20%	55%	22	13.9	21%	19%	1.3
Ningbo Joyson	600699 CH	N	30	30	2	6,370	139	-6%	100%	32	10.3	20%	11%	3.2
Hengli Hydraulic	601100 CH	OW	100	121	21	19,659	166	-9%	108%	38	17.8	17%	19%	2.4
Robosense	2498 HK	OW	34	53	56	2,045	23	-7%	19%	128	2.6	57%	148%	NM
Johnson Electric	179 HK	OW	21	59	186	2,462	15	-31%	173%	8	9.8	-3%	21%	0.5
Wolong Electric	600580 CH	N	38	37	-1	8,573	234	-24%	243%	NA	9.5	42%	4%	NM
Orbbee	688322 CH	NC	77	NA	NA	4,523	76	-14%	93%	101	9.6	300%	138%	1.7
Horizon Robotics	9660 HK	OW	7	13	76	13,826	124	-15%	141%	NM	-26.2	54%	-18%	NM
UBTECH Robotics	9880 HK	OW	105	169	61	6,735	100	-17%	130%	NA	-12.4	42%	49%	NM
Shenzhen Dobot	2432 HK	NC	32	NA	NA	1,591	18	-16%	60%	NM	-3.0	23%	32%	NM
OneRotics	6600 HK	NC	107	NA	NA	3,078	11	33%	9%	NM	-0.1	-367%	96%	NM
Geekplus	2590 HK	NC	18	NA	NA	3,038	12	NA	30%	90	2.2	NM	NM	NM
XPeng	9868 HK	OW	63	135	113	15,505	146	-20%	70%	NM	-1.2	73%	27%	NM
XPeng	XPEV US	OW	16	34	114	15,220	115	-22%	72%	NM	-1.2	73%	27%	NM
Hiwin	2049 TT	UW	302	160	-47	3,384	63	56%	-41%	63	4.6	-29%	20%	3.8
Bizlink	3665 TT	OW	2,755	2,100	-24	17,022	220	81%	151%	44	28.3	102%	32%	1.8
Sinbon	3023 TT	N	289	235	-19	2,201	20	44%	-27%	22	20.5	-15%	4%	5.3
TM Robot	4585 TT	NC	298	NA	NA	989	5	-12%	-36%	NA	NA	46%	NA	NM
HDS	6324 JP	NC	4,270	NA	NA	2,575	39	13%	13%	76	6.4	-53%	225%	1.1
Nidec	6594 JP	UW	2,456	1,800	-27	18,332	94	15%	-25%	14	9.7	-24%	61%	0.4
Minebea Mitsumi	6479 JP	OW	3,055	3,700	21	8,166	39	-3%	22%	13	9.9	25%	29%	0.6
NVIDIA	NVDA US	OW	200	265	33	4,851,252	31,847	7%	39%	43	83.2	147%	58%	1.2
Tesla	TSLA US	UW	374	145	-61	1,403,589	24,946	-17%	11%	187	6.2	-31%	20%	11.2
ABB	ABBN SW	N	77	70	-9	181,383	232	30%	21%	33	31.1	22%	16%	2.4
Siemens	SIE GR	OW	241	325	35	220,040	396	1%	27%	21	14.3	13%	21%	1.1
Schaeffler	SHA0 GR	N	8	10	19	9,303	16	1%	97%	13	8.1	153%	45%	0.4
Hyundai Motor	005380 KS	OW	512,000	670,000	31	70,763	1,219	72%	40%	11	9.0	-15%	19%	0.7
Average										55	10	27%	44%	2.3

Source: Bloomberg Finance L.P., J.P. Morgan estimates for covered names. Priced as of 23 April 2026.