Research Insights

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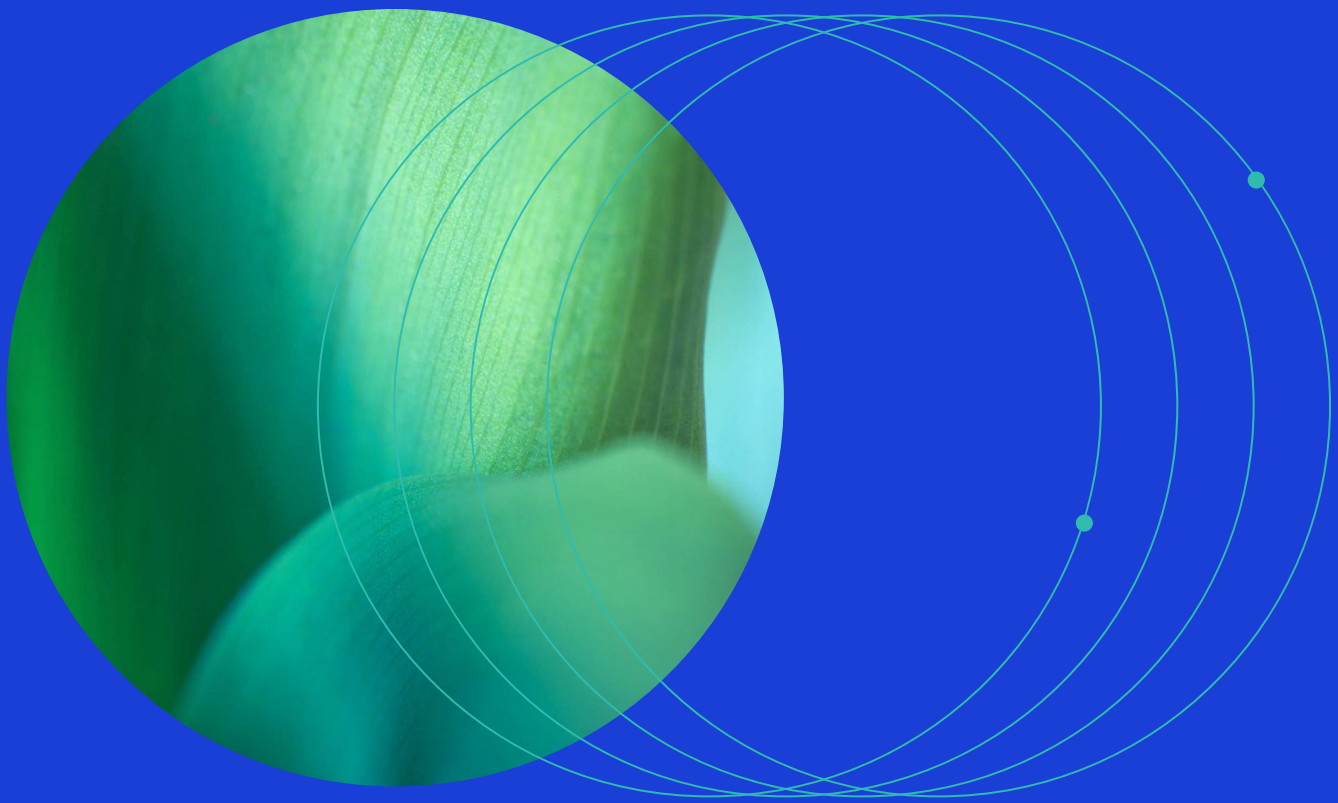
The Total Portfolio Approach: An Analytical Toolkit

Part two in the ‘Beyond Asset-Class Silos’ series



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Executive summary

The growth of private markets, a more volatile macroeconomic environment and a broader risk landscape have collectively exposed the limits of the asset-class silos of traditional strategic asset allocation (SAA) as a framework built for a simpler investment world.

The total portfolio approach (TPA) offers a more integrated alternative. This is the second in a series of papers examining what a shift to TPA involves across three dimensions.

Organizationally, TPA requires a genuine transfer of authority from board to the investment team. The board narrows its role to expressing total risk appetite and defining the overall active risk budget. The investment team takes on accountability for total fund outcomes. People, culture and incentive structures all need to evolve accordingly. This was the focus of Part 1.

Analytically, TPA depends on cross-asset class factor models capable of placing public and private assets in a common risk framework. These models reveal concentrations that asset-class-level reporting may obscure, and they provide the covariance structure needed to measure market risk and diversification across the total portfolio. That same structure also underpins implied return hurdle rates for evaluating new opportunities. Two further sets of risk sit outside that covariance structure. Thematic and emerging exposures, from AI disruption to geopolitical stress, cut across public and private holdings. Capital risk and funding liquidity risk, the constraints that bind private fund commitments specifically, sit outside this structure and call for separate treatment. This Part 2 of the series addresses these questions.

In practice in Part 3 of the series, we illustrate how this analytical framework translates into practice through a set of institutional case studies, giving practitioners a concrete sense of how TPA tools can be applied to real portfolio decisions.

TPA is not an all-or-nothing transition. Most institutions begin by introducing cross-asset class analytics and factor views within their existing SAA structure. The organizational changes can follow as capabilities and confidence develop.

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1 Introduction

Part 1 of this series, "Beyond Asset-Class Silos: The Total-Portfolio Approach," examined the organizational case for TPA: the limits of managing a complex, multi-asset portfolio through asset-class silos, the governance changes required to shift accountability to the total fund level and the mechanisms that make that transition workable (Hollo, Melas and Ruban 2026). This paper turns to the analytical question: What does an institution that wants to manage its portfolio in total terms actually need?

The answer has three parts. The first is a common risk language, a framework that measures public equities, private credit, real estate and infrastructure in the same units, across governance layers from board to investment and risk teams. The second is a view of thematic and emerging risk exposures as AI disruption, geopolitical stress or physical climate hazards, which cut across public and private holdings at once and should be assessed at the total portfolio level. The third is a way to capture the risks specific to private investments, funding liquidity risk and capital risk, which call for a cash-flow model built for that purpose. This paper addresses all three.

Three pillars of the analytical framework

Common risk language	Thematic and emerging risk	Private assets risk
• Correlations • Risk concentration • Hurdle rate assesment • Stress testing	• Physical risk • Geopolitical risk • Thematic risks	• Funding liquidity • Capital risk • Commitment pacing

2 The comparability problem

2.1 Two data worlds

Public and private assets exist within genuinely different data environments. Listed equities have daily prices, observable transactions and continuous mark-to-market valuation. Private assets, including real estate, infrastructure, private equity and private credit, are valued quarterly or annually by appraisers, using comparable transactions and discounted cash-flow analysis rather than market prices.

The difference matters for risk analysis. Appraisal-based valuations are inherently smooth, as appraisers tend to spread revisions across multiple valuation cycles rather than marking assets down sharply in response to market events. The result is that reported private asset returns appear more stable than they actually are, apparent volatility is compressed and correlations with public markets appear artificially low.

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A covariance matrix built from a mix of daily public market returns and smoothed quarterly private asset returns understates the true risk of private assets and overstates their diversification benefit.

2.2 The silos problem

Beyond the data challenge, investment teams have historically been organized around asset class boundaries. The equity team watches active share and tracking error. The real estate team monitors leverage and vacancy risk. The fixed income team manages duration and spread exposure. None of these measures, taken alone, reveals how much total risk any sleeve contributes to the portfolio as a whole, or whether the risks one team takes are correlated with the risks taken by another team.

Consider a portfolio with material allocations to listed technology stocks, technology-focused venture funds in the private equity sleeve and data center assets in the real estate allocation. Expressed as a list of vehicles and asset class labels, the allocation appears diversified. Expressed in factor terms, the three sleeves may carry overlapping exposure to the same underlying risk driver: the performance of a narrow segment of the global economy. Using a multi-asset-class factor model makes this concentration visible.

3 Factors: the common language

Both problems, incomparable data and siloed measurement stem from the fact that there is no shared unit in which a private commitment and a listed holding can be expressed. A factor model can establish that common language.

3.1 Factors across asset classes

Factors are systematic sources of risk and return, and some of them are shared across asset classes. Equity market risk drives listed equities and private equity. Credit spreads drive corporate bonds and private credit. Private infrastructure splits. Assets with stable, steady cash flows carry interest rate and credit exposure, while growth-sensitive assets behave more like equity.

Because these risk sources are common across asset class boundaries, they serve as a unit of measure that translates one team's exposures into another's. A private equity allocation and a listed equity allocation are both exposed to equity market, industry and style factors. A private credit allocation and a corporate bond allocation are both exposed to credit spreads and interest rates. Private assets, however, do carry factor exposures with no public counterparts. Still, the common unit makes the comparison possible, and factors help surface concentrations of risk that are shared across asset classes but invisible when each sleeve is analyzed on its own.

3.2 One model, multiple audiences

The MSCI Multi-Asset Class (MAC) Factor Model (Shepard et al., 2020) is structured across five tiers to match the information needs of different decision-makers within an institution. At the base, a local tier of over 3,500 market-specific factors provides the detailed foundation from which all higher tiers are built. Atop this, four coarser tiers offer increasingly aggregated views of the same underlying risks.

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The tiers exist because different teams need different levels of granularity. An allocation team may need a higher-level view of risk drivers than a specialized emerging markets (EM) team, and a risk team looking to identify what is actually driving portfolio risk will need a more granular one still. Moving between tiers makes it possible for them to share a common language. The risk number they look at is the same, but how it is decomposed depends on the specific investment problem each of them is solving.

At Tier 1, nine broad factors span the full asset class spectrum: equity, home bias,[1] foreign currency, interest rates, credit, inflation, real estate, commodities and pure private equity. These are the factors that matter for board and investment committee discussions. They are broad enough that every asset class has meaningful exposure to at least one, specific enough that relative exposure sizes convey real information about where portfolio risk is concentrated.

Lower tiers add granularity. Tier 2 introduces key risk premia and systematic strategies; Tier 3 adds regions, sectors and strategy factors; Tier 4 reaches full global multi-asset class detail. These give risk teams the resolution to trace concentration drivers toward the security level, with the local factor layer providing the ultimate foundation for security-level attribution. The residual between any global tier and the local layer serves as a concentration warning, indicating when the high-level view is missing detail that matters.

The tier structure is not the only way the model adapts to different decision-making needs. The MAC model comes in different horizon variants. Shorter horizon versions weight recent market conditions more heavily; longer ones draw more on older observations, capturing structural relationships that persist across market cycles. In practice, short-horizon estimates tend to support near-term risk monitoring and tactical decisions; the extra-long variant is better suited to strategic allocation.

With the same model underpinning every tier, the board's aggregate equity factor exposure and the risk team's security-level equity attribution are fully consistent.

[1] The home-bias factor captures the return of the home equity market against the global market excluding the home market. A portfolio overweight in its domestic market carries positive exposure.

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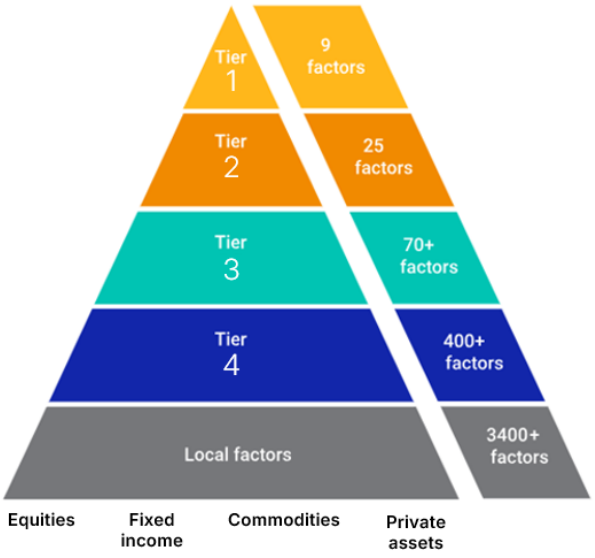
Tier structure of the MSCI MAC Factor Model



3.3 Crossing the public-private divide

Making a cross-asset factor model work for private assets requires solving the smoothing problem. The MAC model addresses this through a Bayesian unsmoothing procedure applied to the private asset return series.

The core insight is that reported appraisal returns can be modeled as a smoothed version of true underlying returns. A Bayesian correction combines the reported valuations with public market information to recover a return series that better reflects true economic factor exposures. The correlation between private and public equity, measured against raw appraisal-based returns, rises after unsmoothing, more consistent with what theoretical and empirical analysis suggest.

3.4 What factors reveal

Because the risk of a private commitment and a public holding are expressed through the same factors, an investment team can compare them directly and see where their combined exposures concentrate, something asset-class labels alone would hide. Private holdings, once committed, cannot be rebalanced on demand the way listed securities can. The natural response is to work on the other side of the portfolio instead. That is, to deliberately tilt the liquid sleeve to offset whatever unintended exposure the total portfolio is carrying. This is the completion portfolio idea described in part 1 of this series of papers. As one head of listed equities in a TPA organization put it:

> *"I treat my listed-equities program as a completion portfolio for all the illiquid assets that the fund has."*

The same framework also tracks how correlations move across horizons. A relationship measured over a short horizon may sharply differ from the same relationship measured over several years, and the gap

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between the two readings is itself informative. It could signal whether a shift is a passing dislocation or the start of a structural change.

A third capability follows from the same structure. Because every holding's contribution to total portfolio risk can be measured on a consistent basis, a new opportunity can be judged on that contribution rather than on its standalone return. Its expected return must clear an implied hurdle rate, which depends on how it interacts with everything the portfolio already holds.

This view, powerful as it is, is still built on a covariance matrix, and covariance does not capture everything that matters to a long-horizon investor. Some risks that sit outside this matrix are driven by specific events or themes that a covariance matrix cannot see, since correlations describe how assets have moved together in the past rather than what a particular shock would do to a particular holding. Others come with private assets, where illiquidity means an investment stays binding for years and the risks that follow from that are not visible in a return series. Put a different way, these are the second and third pillars in our analytical framework.

4 Thematic and emerging risk

Institutional investors increasingly want to know their exposure to specific themes, and — because a theme usually shows up in several asset classes at once — they want to know it across the whole portfolio rather than one sleeve at a time.

For example, AI disruption could reach listed software, private companies built on the same business models, the data centers and grid capacity serving AI demand, as well as the credit financing them. Held in separate sleeves and measured independently, these look like unrelated positions, which is not the case. A shift in how the market values the theme affects all of them at once, which is why a thematic exposure should be identified and managed at the total portfolio level.

The same is true of geopolitical stress, where a trade dispute touches listed exporters, private manufacturing assets and infrastructure concessions at once (Xu et al. 2026). Physical climate hazards work the same way, following the location of an asset rather than the sleeve holding it.

Measuring the thematic and emerging risk exposures is the first step. Scenario analysis is the second. It estimates what the total portfolio stands to lose if the risk materializes, translating a known exposure into a potential impact (Szikszai et al. 2026).

These, of course, are examples rather than a complete list, and the set will keep changing as new themes emerge. What they have in common is the fact that the exposure runs across asset classes, so no sleeve's own reporting reveals its full size. Measuring it calls for the same portfolio-wide view the factor framework provides for market risk.

5 Private assets

Under a traditional asset allocation framework, a private markets allocation is a policy target to be reached. Most policies build in flexibility, a range around the target rather than a fixed point, and

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managers have discretion to slow deployment through a weak vintage. Even so, the target sets the direction of travel, and as one private markets manager put it:

> *"That creates pressure to commit capital to match the target allocation even when there are no good opportunities to fund."*[2]

Under a total portfolio approach, the board sets how much illiquidity the fund can bear. That budget is an upper limit rather than a target. Competition for capital ranges across private and public markets on the same terms, so if private opportunities are not as compelling as what public markets offer, the capital can be deployed there instead.

Plus, capital flows in both directions. A capital call that cannot be met from cash is funded by selling public holdings, which makes it a public portfolio decision as much as a private one. The privates team needs to know how much and how fast it can commit without risking a liquidity squeeze, and the public team needs to know what liquidity demands are coming.

Risk concentration is another problem. A private and a public investment may load onto the same underlying factor, creating a cross-asset-class concentration that neither sleeve's own reporting would show. The factor language reveals and quantifies it. The judgment then sits at the total portfolio level: whether that risk is worth holding, or whether the public sleeves should be adjusted to compensate.

As mentioned earlier, private valuations arrive quarterly. Between appraisals the reported value sits still, even though the factors driving it have moved. That matters most when public markets move sharply and the private allocation's reported weight rises simply because public markets fell. This adds pressure to react without knowing what private holdings are actually worth. Nowcasting (covered in detail later in this paper) estimates what a holding is worth today, using its factor exposures and the public market moves since the last appraisal.

5.1 Governance

An illiquidity budget[3] belongs to the investment policy statement for the same reason a risk budget does. It gives the board's tolerance for illiquidity a concrete form, reviewed on the same schedule as the rest of the policy, so a committee evaluating a new commitment is asking whether it fits inside the budget, not only whether it earns its place on its own.

Two considerations constrain how much of that budget a program can use, and they are different in kind. Commitment pacing, discussed in the next section, is a financial constraint. It sets how fast capital gets

[2] Opportunity here means what a given institution can actually access. In private markets this varies with size, relationships and the ability to co-invest, so the investable universe differs materially between investors rather than being common to all of them.

[3] It is common to equate budgeting illiquidity with capping NAV. This, however, budgets the wrong object. The true scarce resource is balance-sheet capacity to absorb capital-call spikes, not the level of assets already invested. The illiquidity budget is therefore not "How much of the portfolio is illiquid?" but "How much forced funding risk the portfolio can withstand with high confidence?"

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drawn against the budget and shows up directly in a cash flow projection. Operational capacity is a process constraint that does not show up in any projection at all. Operations limit capacity through origination capacity and monitoring capacity.

Origination capacity is what limits how many new commitments a team can source and diligence in a given year, negotiating terms, running legal review and clearing investment committee. Monitoring capacity is what limits how many live fund relationships a team can service once capital is committed, and because a drawdown fund offers no exit, that relationship persists for a decade or more after the origination work is done. A program can be well inside its financial pacing limits and still be overextended, not because it is sourcing too many new deals, but because the number of live relationships accumulated from prior vintages has outgrown what the monitoring team can service. The two functions may sit with different teams entirely, and their capacity ceilings need to be tracked separately rather than assumed to move together.

5.2 Illiquidity risk and commitment pacing

Illiquidity means something different in private markets than in public ones. A thinly traded public security is hard to sell, but it can still be sold, albeit at a higher cost. A private fund commitment is a decade long legal agreement that prohibits liquidity by design, because the fund's strategy needs patient capital to work. This is a different kind of constraint, not a further point along the same spectrum.[4]

Being unable to exit (secondary transactions aside), leaves the investor with two obligations that cannot be traded away. The first is the obligation to fund. Capital is drawn on the general partner's (GP) schedule, and a call can land when reserves are already stretched thin. This is funding liquidity risk, and the measure that matters is the maximum capital an investor might need within a given period at a chosen confidence level. The second is the obligation to hold. The path a fund's reported value takes along the way matters less than where that value lands at the end. This is capital risk: the danger of a permanent loss over the life of the fund, measured against the present value of expected cash flows. Measuring either requires a model that projects capital calls and distributions directly (Jeet 2020b).

Careful commitment pacing is how an institution may mitigate the squeeze. It sets how aggressively to commit new capital and how fast exposure builds as a result. Commit too slowly and capital sits idle. Commit too quickly and the portfolio overshoots into a liquidity squeeze it cannot easily unwind. A good commitment-pacing plan is often seen as the lynchpin of a private capital program and can account for much of the dispersion in performance across limited partners (LPs) (Jeet 2020a, Jeet and Meyer 2026). Creating such a plan requires a model, since a young fund still calling capital and a mature one returning

[4] Evergreen funds and secondary markets are sometimes cited as proof that this has softened. Both are procyclical in the same way the underlying commitment is. Evergreen redemption gates activate when requests spike, which is exactly when markets are under stress. Secondary discounts widen at the same moment, reaching 30% to 50% compared with 8% to 15% in calm markets (Preqin 2022). Tokenization is sometimes raised as a further route to liquidity, and settlement infrastructure has advanced quickly through 2026: it can shorten settlement time and automate transfer mechanics. It does not touch the underlying constraint, since the fund still needs a buyer, and buyers often disappear exactly when sellers need them most.

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it can carry an identical label but very different cash flow profiles (Lester, O'Shea and Warren 2024). MSCI's Private Capital Cash Flow Forecast Model is one implementation.[5]

Capital calls do not simply peak as markets fall. In ordinary downturns they tend to track depressed distributions downward, but at the onset of a severe shock they can briefly spike, concentrated in leveraged strategies like senior debt, even as real estate and infrastructure barely move (O'Shea 2025). A spike timed to a public market shock turns a liquidity problem into a permanent cost, since the fund may be forced to sell when markets are down. Managed sleeve by sleeve, the private program optimizes its own pacing while the public sleeve absorbs that cost.

5.3 Factor models and transparency

Factor models place a private holding on the same footing as a public one by mapping them to a shared set of return drivers. This makes the concentration check described earlier in this paper possible for private assets in the first place. Again, once mapped into the same factor space, a private and a public position can be compared directly, and a risk concentration that neither sleeve's own reporting would show becomes visible at the total portfolio level.

What is new here is how precisely that placement can be made, since it depends on the availability of data. At a minimum, a private fund can be modeled from its characteristics alone, such as strategy, region and sectoral focus for private equity, or lending strategy, region and leverage for private credit. That places it in the same factor space as the rest of the portfolio but only based on aggregate characteristics. Underlying holdings-level data sharpens that estimate further, mapping the private assets the way a public portfolio's constituents would be mapped rather than relying on aggregate fund characteristics alone.[6]

5.4 Nowcasting

A framework that monitors public and private exposures against one illiquidity budget only works if both sleeves report on a comparable basis. Nowcasting estimates an interim value from a holding's factor exposures and public market moves since the last quarterly appraisal. It puts a private holding on the same clock as a public one for monitoring purposes, without pretending the two trade the same way.

It is a current best estimate, not a substitute for the eventual appraised value.[7] The gap between a nowcast and the appraisal that eventually lands is itself informative, however. A fund whose nowcast consistently overshoots or undershoots the eventual mark is telling the investor something worth

[5] The Takahashi-Alexander framework models capital calls and distributions as rates against uncalled capital and valuation, and extensions that let growth respond to public market movements make its projections more realistic without abandoning its structure (Jeet 2020b, Takahashi and Alexander 2002). MSCI's Private Capital Cash Flow Forecast Model builds on this framework, keeping the Takahashi-Alexander contribution model but using a more flexible, data-calibrated distribution and growth model better suited to forecasting across a pool of funds (Hadley 2025).

[6] Fund transparency data of this kind is available through MSCI Private Assets Solutions.

[7] Applied across a universe of funds by strategy, vintage and geography, the same estimation supports private capital indexes that update between appraisal dates rather than quarterly. MSCI indexes cover nowcasted private capital indexes for private equity and private credit.

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investigating; whether that is a manager whose valuations run conservative or aggressive, a factor model too coarse for the holding or operational improvement the appraisal has not yet caught up to. Distinguishing between them shapes how much weight to put on the estimate in the meantime.

A nowcast is calibrated to the appraisal. What it changes is timing, with the direction of a move becoming visible a quarter before the appraisal confirms it. That matters mostly after a sharp public market move, when reported private weights inflate simply because public markets fell, while the private appraisal has not yet caught up. Nowcasting incorporates those intra-quarter public market moves into the private valuation estimate, which may prevent unnecessary cuts to the private allocation, whether by selling into the secondary market or by delaying new commitments.

6 The framework in action

The previous sections described the analytical tools for a total portfolio approach. But how does an institution start building it out? This section looks at some of the practices that have been adopted.

6.1 An enhanced-SAA entry point

An institution still operating under a traditional SAA structure can begin applying cross-asset factor analysis as an overlay on existing processes — without institutional transformation. In practice, this means running the factor model across all existing sleeves, aggregating the results and asking questions the silo structure cannot answer: What is the total portfolio's equity factor exposure, including the private equity allocation? What fraction of total portfolio risk comes from interest rate sensitivity, across fixed income, real estate and infrastructure combined? Are the factor exposures of the equity team and the real estate team correlated? What is the portfolio's exposure to a theme like AI disruption, across public and private holdings?

The answers may prove surprising. A portfolio that appears diversified by asset-class label may prove concentrated in a small number of factors. Identifying this concentration requires only adding the cross-asset factor lens on top of the existing governance structure.

This is what might be called an enhanced SAA, the toolkit of total portfolio management layered onto a traditional SAA structure. Allocation decisions can be assessed in common risk terms before they are made, and the same toolkit scales naturally as the institution moves further toward total portfolio decision-making.

6.2 Portfolio architecture in practice

Institutions implement the total portfolio approach through different portfolio structures, which vary along a few design choices.

- **The anchor:** whether the portfolio is measured against an index reference portfolio, an absolute return target or a regulatory benchmark.
- **The number of layers:** how many portfolios sit between that anchor and the assets held, from a single total portfolio to two or three distinct layers.

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- **The allocation-selection split:** whether it is built into the architecture or left to attribution to recover.

The third needs a word of explanation. The allocation decision sets what to own and in what proportions, fixing the portfolio's market exposures before any security is chosen. Selection is how managers implement within each allocation. Do they match the securities in a selected representative index or take active positions to outperform it? An institution can separate the two in its architecture, by holding a distinct allocation portfolio, or leave them combined and rely on factor attribution to show where the active risk is coming from.

These choices produce a handful of recognizable configurations. Some institutions anchor to a single reference portfolio that expresses the board's risk appetite and measure all active risk against it. Some use an absolute return target as the sole anchor, with no reference benchmark, and measure risk on the total portfolio against their own objectives. Others face regulatory performance tests against a prescribed benchmark and stay tightly aligned with it while using a factor framework internally for decisions. On top of any of these, an institution may insert a formal capital allocation portfolio between the anchor and the actual holdings, which makes the split between allocation and selection explicit in the architecture.

In some cases, the board may express their risk appetite as a tracking-error limit relative to the reference portfolio. The reference portfolio is a public-only benchmark that serves as performance hurdle rather than a target allocation. Institutions using a reference portfolio should watch that the tracking error budget is not set too narrow. A genuine diversifier raises tracking error precisely because it does not move with the benchmark, and that same low correlation is what improves the portfolio's risk-adjusted return. A budget set too tight may indiscriminately screen out real diversification, rewarding whatever concentration the benchmark itself carries instead.

Regardless of where an institution lands, the same factor language describes the risk in comparable terms with the same exposures measured the same way at the anchor, at any intermediate layer and for the total portfolio, so the numbers can be compared across layers.

6.3 The role of indexes

When a fund anchors its risk to a reference portfolio, separates allocation from selection through an intermediate capital allocation portfolio or measures against any other performance benchmark, it needs a concrete way to express that portfolio. A general description can work, but indexes make it practical by providing a well-defined, investable composition that can map cleanly to the factor model. Building the allocation from indexes therefore turns a set of asset-class weights into something with a precise, readable factor profile, comparable across asset classes.

MSCI's index suite is built with this in mind. It spans listed equity, sovereign and corporate fixed income, commodities and, through the MSCI Private Capital Indexes, private equity, private credit, private infrastructure and private real estate. That breadth lets a single allocation framework reach across the whole portfolio, public and private alike, with each building block resolving to the same factor language. Appendix C lists the specific index coverage.

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7 A worked example

To provide a concrete example, we consider a hypothetical three-layer portfolio structure: a reference portfolio expressing the board's risk appetite, a capital allocation portfolio expressing the investment team's asset allocation target and a total investment portfolio of holdings. We chose three layers because they show the framework at full resolution, with allocation risk and selection risk visible as separate objects. None of the analysis that follows depends on that choice. Every diagnostic runs on factor exposures, and those exist regardless of how many portfolio layers an institution defines. The structure determines how many comparison points are available; the factor lens does the analytical work either way.

The three portfolios are shown below and serve as a running illustration through this section; the specific holdings are only an example, and real portfolios vary widely by institution. The reference portfolio is a 60/40 mix of global equities and government bonds, represented by the MSCI ACWI Index and the MSCI Developed Markets Government Bond Index, respectively. The capital allocation portfolio diversifies substantially, into public equity, fixed income, private equity, commodities, private credit, real estate and infrastructure.[8] The total portfolio aims to match the capital allocation at the asset-class level but is bound by illiquidity in that private market positions cannot be built or unwound on demand and take time to reach their target weights. We used April 2026 as the portfolio as-of date and, if not otherwise stated, the long-horizon version of the MAC model.

The rest of this section follows these three portfolios through a cycle covering a monitor stage (what the numbers show), an analyze stage (what drove the numbers) and the act stage (what an investment team does about it). The cycle is a useful way to think about the process because total portfolio management is continuous, and each decision becomes the starting point for the next review.

[8] The equity sleeves were represented by MSCI USA, MSCI World ex USA and MSCI Emerging Markets Indexes. The fixed income sleeves were represented by the MSCI Developed Market Government Bond, the MSCI USD IG Core Corporate Bond and the MSCI USD EM Sovereign Bond Indexes. The commodity sleeve was represented by the MSCI Gold Futures Index. The private asst sleeves were represented by the MSCI All Country Private Equity Daily, the MSCI Global Private Credit Closed-End Fund, the MSCI Global Private Infrastructure Closed-End Fund and the MSCI Global Annual Property Indexes.

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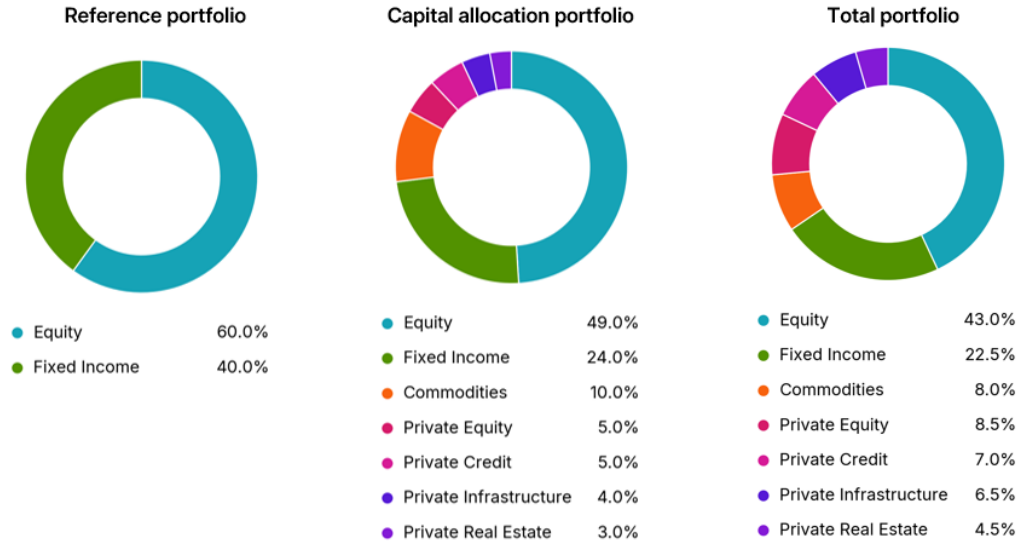
The three hypothetical portfolios at a glance



7.1 Monitor

The monitor stage gives a live read of where the portfolio stands, aggregating all three layers into a single risk view. The natural place to start is total volatility, and it was unremarkable. The reference portfolio carried 9.86%, the capital allocation portfolio 10.11% and the total portfolio 9.95%. Three portfolios of visibly different composition, all landing within a quarter-point of each other. On this measure alone, the diversification into private markets appeared to have done very little.

The factor decomposition told a different story, and it is the first illustration of why the surface view misleads. The charts below break each portfolio's risk down by Barra factor group. In the reference portfolio, the equity-market factor accounted for 77% of total risk, as expected for what was essentially an equity-and-bonds mix. The capital allocation portfolio brought that down to 65%, with commodities, term structure and private real estate now contributing. This is the intended diversification: the same overall risk level spread across more factors. Yet the total portfolio pushed the market share back up to 68%. The gap between the capital allocation portfolio and the total portfolio was the mark of implementation, the portfolio actually carried more concentrated market risk than the allocation was designed for.[9] Total volatility never showed this — only the factor lens did.

[9] Which holdings drove that drift becomes visible one layer down, in the first chart in section 7.2.

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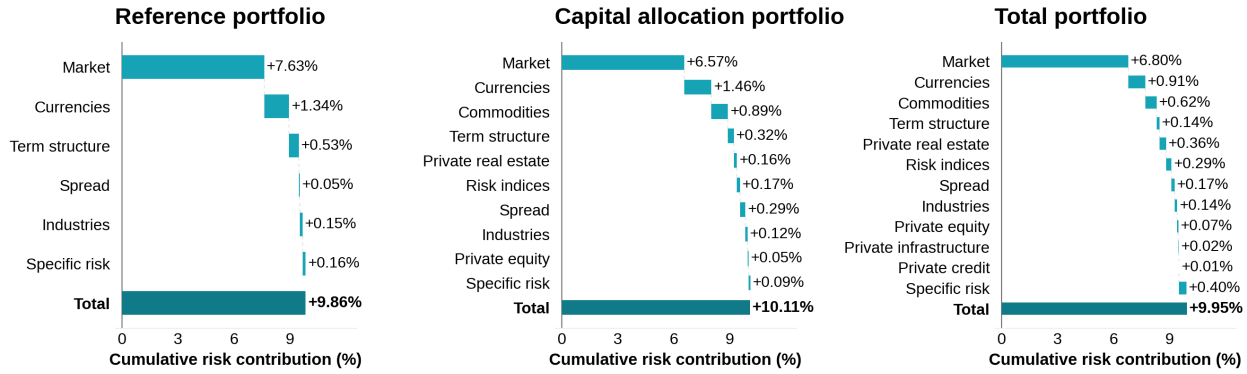
Three portfolios with similar headline volatility but different risk profile



Factor	Contribution (%)	% of total
Market	+7.63	77.4
Currencies	+1.34	13.6
Term structure	+0.53	5.3
Spread	+0.05	0.5
Industries	+0.15	1.6
Specific risk	+0.16	1.6
Total	**+9.86**	**100.0**

Factor	Contribution (%)	% of total
Market	+6.57	65.0
Currencies	+1.46	14.4
Commodities	+0.89	8.8
Term structure	+0.32	3.2
Private real estate	+0.16	1.5
Risk indices	+0.17	1.6
Spread	+0.29	2.8
Industries	+0.12	1.2
Private equity	+0.05	0.5
Specific risk	+0.09	0.9
Total	**+10.11**	**100.0**

Factor	Contribution (%)	% of total
Market	+6.80	68.4
Currencies	+0.91	9.2
Commodities	+0.62	6.2
Term structure	+0.14	1.4
Private real estate	+0.36	3.6
Risk indices	+0.29	2.9
Spread	+0.17	1.7
Industries	+0.14	1.4
Private equity	+0.07	0.7
Private infrastructure	+0.02	0.2
Private credit	+0.01	0.1
Specific risk	+0.40	4.0
Total	**+9.95**	**100.0**

The next question is where the portfolio's risk actually sits in the world, and here country of listing and country of economic exposure[10] provide different answers, and both matter. Listing location determines which market a holding trades in and which regulatory regime it sits under, while economic exposure determines what actually drives its cash flows. The chart on the left places the listing country weights of the three portfolios side by side. Read as allocation, the total portfolio looked heavily concentrated in the United States. The chart on the right, on the other hand, traces the underlying economic exposure of the holdings, and the picture shifts materially. U.S. exposure changed a little for the total portfolio, while exposure to China rose to several times its listed level, carried in through the revenue that U.S.- and

[10] Economic exposure reflects the geographic distribution of a company's revenue, capturing which economies actually drive its performance.

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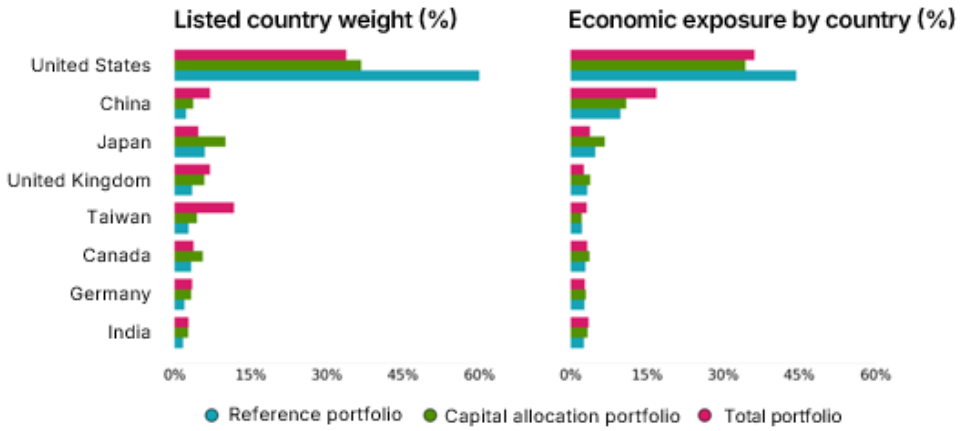
Europe-listed companies earned abroad. The two views describe the same portfolio from different angles.

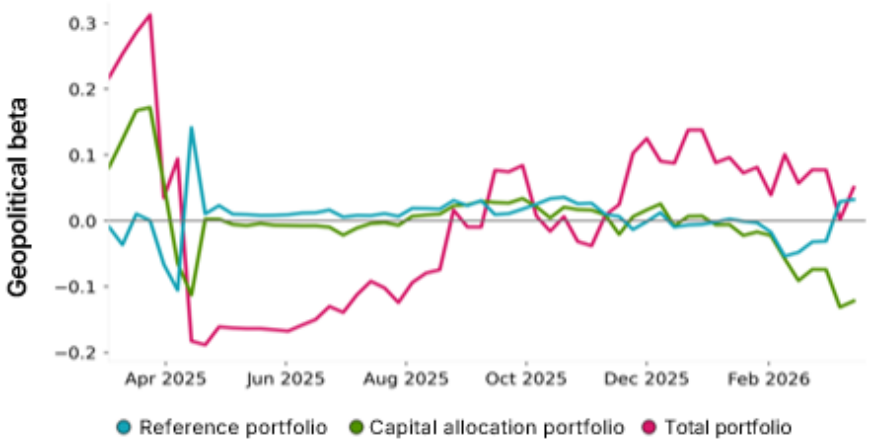
Economic and listed country exposures show a complementary picture



Geopolitical stress is a further dimension of risk worth watching in its own right. Standard risk measures say little about how a portfolio would respond to a trade war or a regional conflict, yet these events move markets in ways that cut across sectors and geographies. MSCI's geopolitical beta measures each equity holding's sensitivity to a geopolitical risk indicator and aggregates it up. A positive beta means the holdings tend to gain when geopolitical tensions rise; a negative beta marks vulnerability.

The chart below tracks this for the three portfolios over the past year. After diverging around the April 2025 tariff shock, they settled near zero through mid-year 2025, then the total portfolio drifted positive into early 2026, pulling away from the reference and capital allocation portfolios. Watching how this exposure evolves lets an investor see a geopolitical vulnerability forming and allows them to determine whether to adjust before the next shock, rather than after.

Geopolitical beta time series



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Correlations are the next thing to watch, because a portfolio's diversification depends on them, and they shift over time. The table below tracks key cross-asset relationships at different model horizons. The one that mattered most for this portfolio was between equities and government bonds, the diversifying pair many institutional portfolios lean on. Measured over the last three months it had risen to 0.63; over the past year it sat at 0.32[11]. The hedge had weakened sharply in the recent window.

The model adds depth to that observation. At a short horizon, the estimate stayed elevated, consistent with what the recent data showed. At a long horizon, it sat materially lower. That gap suggests the shift is still driven by the recent episode rather than embedded in the longer-run relationship. The thing to watch is whether the gap closes. If the long-horizon estimate starts climbing toward the short one, it indicates that the weakening of the hedge may no longer be a passing episode but a lasting regime change, and perhaps a signal to act.

Asset class correlations over different horizons

	Realized		Model		
Pair	**3M**	**1Y**	**MAC.S**	**MAC.L**	**MAC.XL**
Equity / Fixed income MSCI ACWI / MSCI DM Govt Bond	0.63	0.32	0.29	0.28	0.16
Equity / Private equity MSCI ACWI / MSCI AC Private Equity	0.82	0.88	0.69	0.68	0.69
Equity / Gold MSCI ACWI / MSCI Gold Futures	0.43	0.25	0.23	0.24	0.17
Equity / Oil MSCI ACWI / MSCI WTI Oil Futures	-0.56	-0.34	0.13	0.17	0.26

The realized correlation shown here is measured on the MSCI All Country Private Equity Daily Index, a nowcasted index. Its daily returns already track public equity to some degree by construction, which inflates the realized figure independent of any change in the underlying economic relationship. The model estimate is not directly comparable to it, since that reflects the structural relationship recovered through unsmoothing rather than a series that itself embeds public market movements.

7.2 Analyze

Analysis is where the factor model proves its value, because a single exposure can be traced from the total portfolio down to the individual holding behind it.

Most of the risk in the hypothetical portfolio is systematic and unsurprising. The equity-market factor, the common return that every public and private equity shares, is the single largest driver, as it is for any equity-heavy portfolio. The more revealing exposure is equity beta, a factor that captures how much a stock amplifies or dampens broad market moves beyond what the market factor already explains. It

[11] Analysis horizons are with respect to the as-of date, April 2026.

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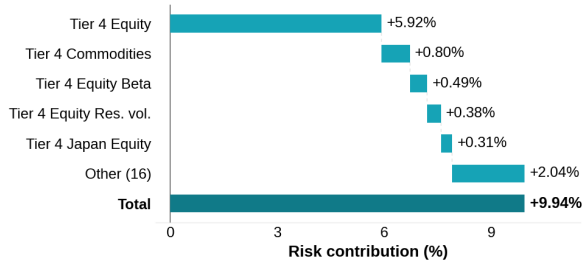
contributes almost fifty basis points on its own, the third-largest single factor in the portfolio after the market factor itself.

Attribution analysis highlights risk concentrations in equity beta

Factor risk attribution

MAC.S | MAC.L | MAC.XL

Factor level: Tier 4 | Top: 5 | Total | Active



FACTOR	RISK (%)	EXPOSURE	% OF TOTAL
Tier 4 Equity	+5.92	0.554	59.5
Tier 4 Commodities	+0.80	0.080	8.1
Tier 4 Equity Beta	+0.49	0.059σ	4.9
Tier 4 Equity Residual Volatility	+0.38	0.016σ	3.8
Tier 4 Japan Equity	+0.31	0.028	3.1
Other (16)	+2.04	—	20.6
Total	**+9.94**	—	**100.0**

Asset risk decomposition

TOTAL — Top assets and sleeves driving **Tier 4 Equity Beta**
Total contribution: **+0.491%**

NODE	WEIGHT (%)	RC (%)	EXPOSURE	SHARE OF GROUP (%)
▼ **Equity** CLASS	43.00	+0.406		82.6
▸ **Developed Ex USA** SLEEVE	20.00	+0.168		34.1
▸ **Emerging Markets** SLEEVE	8.00	+0.149		30.4
▸ **US Equity** SLEEVE	15.00	+0.089		18.1
▼ **Private Equity** CLASS	8.50	+0.086		17.4
▸ **Private Equity** SLEEVE	8.50	+0.086		17.4

Taking a closer look at where this risk comes from, we see that roughly nine of those basis points trace to private equity, a sleeve the portfolio cannot easily rebalance day to day. The remainder comes from public equity, concentrated in developed market (DM) ex-U.S. and emerging market holdings rather than the U.S. sleeve. Looking closer at the individual names behind the developed ex-US contribution, a handful stand out for pulling in the other direction: Nestle SA, Shell PLC, TotalEnergies SE and Iberdrola S.A. all carry a negative contribution, exactly the defensive, lower-beta names one would expect to pull in the other direction from ASML Holding N.V., Banco Santander S.A. and other high beta stocks, driving the exposure up.

The model locates the concentration; it does not say whether the concentration is worth holding. That judgment belongs to the manager, who weighs the risk against their return view. What the drill-down provides is the concrete basis for that call. Since the private equity contribution cannot be rebalanced on

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demand, any adjustment has to happen through the public sleeves, and the same decomposition that located the exposure also points to exactly which holdings may be the ones to adjust.

Sleeve look-through identifies the largest contributors and their additional exposures

Asset risk decomposition

TOTAL — Top assets and sleeves driving **Tier 4 Equity Beta**

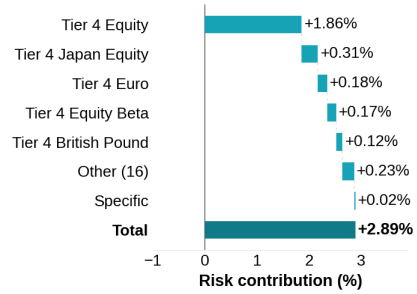
Total contribution: **+0.491%**

NODE	WEIGHT (%)	RC (%)	EXPOSURE	SHARE OF GROUP (%)
▼ **Equity** CLASS	43.00	+0.406		82.6
▼ **Developed Ex USA** SLEEVE	20.00	+0.168		34.1
▸ ASML HLDG ASSET	1.26	+0.048	0.871σ	9.7
▸ HSBC HOLDINGS (GB) ASSET	0.70	+0.037	1.54σ	7.6
▸ SIEMENS ASSET	0.45	+0.033	1.66σ	6.7
▸ SHOPIFY A ASSET	0.36	+0.029	-0.520σ	5.8
▸ BANCO SANTANDER ASSET	0.41	+0.028	1.61σ	5.8
▸ NESTLE ASSET	0.63	-0.026	-0.930σ	-5.2
▸ AGNICO EAGLE MINES ASSET	0.26	+0.024	3.32σ	4.9
▸ SHELL ASSET	0.68	-0.024	-1.02σ	-4.9
▸ TOTALENERGIES ASSET	0.47	-0.024	-1.19σ	-4.9
▸ IBERDROLA ASSET	0.37	-0.020	-1.26σ	-4.1

Developed Ex USA

Weight **20.00%** · Total RC **+2.891%**

Tier: Tier 4 ▾ Top: 5 ▾



FACTOR	RC (%)	EXPOSURE	% OF TOTAL
Tier 4 Equity	+1.86	0.200	64.5
Tier 4 Japan Equity	+0.31	0.028	10.7
Tier 4 Euro	+0.18	6.85%	6.2
Tier 4 Equity Beta	+0.17	-0.072σ	5.8
Tier 4 British Pound Sterling	+0.12	3.93%	4.2
Other (16)	+0.23	—	7.8
Specific	+0.02	—	0.9
Total	**+2.89**	—	**100.0**

The analysis so far described the portfolio as it stood. Stress testing asks what happens when the environment breaks?

Below, we show how a recession scenario impacts to the portfolio. The total portfolio would have lost 6.31% and the capital allocation portfolio 5.88%. The gap between the two came almost entirely from the private sleeves. Private equity contributed -1.26% in the total portfolio against -0.79% in the capital

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allocation portfolio, private infrastructure -0.48% against -0.08% and private real estate -0.31% against -0.12%.[12] The public sleeves' contributions were close to identical.

Factor shock under the recession scenario

Shocked factors			
US country	−13	%	Market
EUR Europe equity	−12	%	Market
USD rate 1Y	−99	bps	Term structure
USD rate 10Y	−56	bps	Term structure
USD inflation 1Y	−57	bps	Inflation
USD inflation 10Y	−11	bps	Inflation

The gap between the capital allocation portfolio loss and the total portfolio loss was the cost of drift under stress, visible now rather than after a real drawdown. That number gave the investment team a concrete basis for deciding whether to hedge, adjust or accept it.

[12] A framework built on realized correlations would understate how much public equity shocks transmit into private markets, because appraisal smoothing suppresses the measured co-movement. The MAC model's correlation structure corrects for this through Bayesian unsmoothing, which is why private equity appeared as a meaningful contributor to the stressed loss rather than a bystander.

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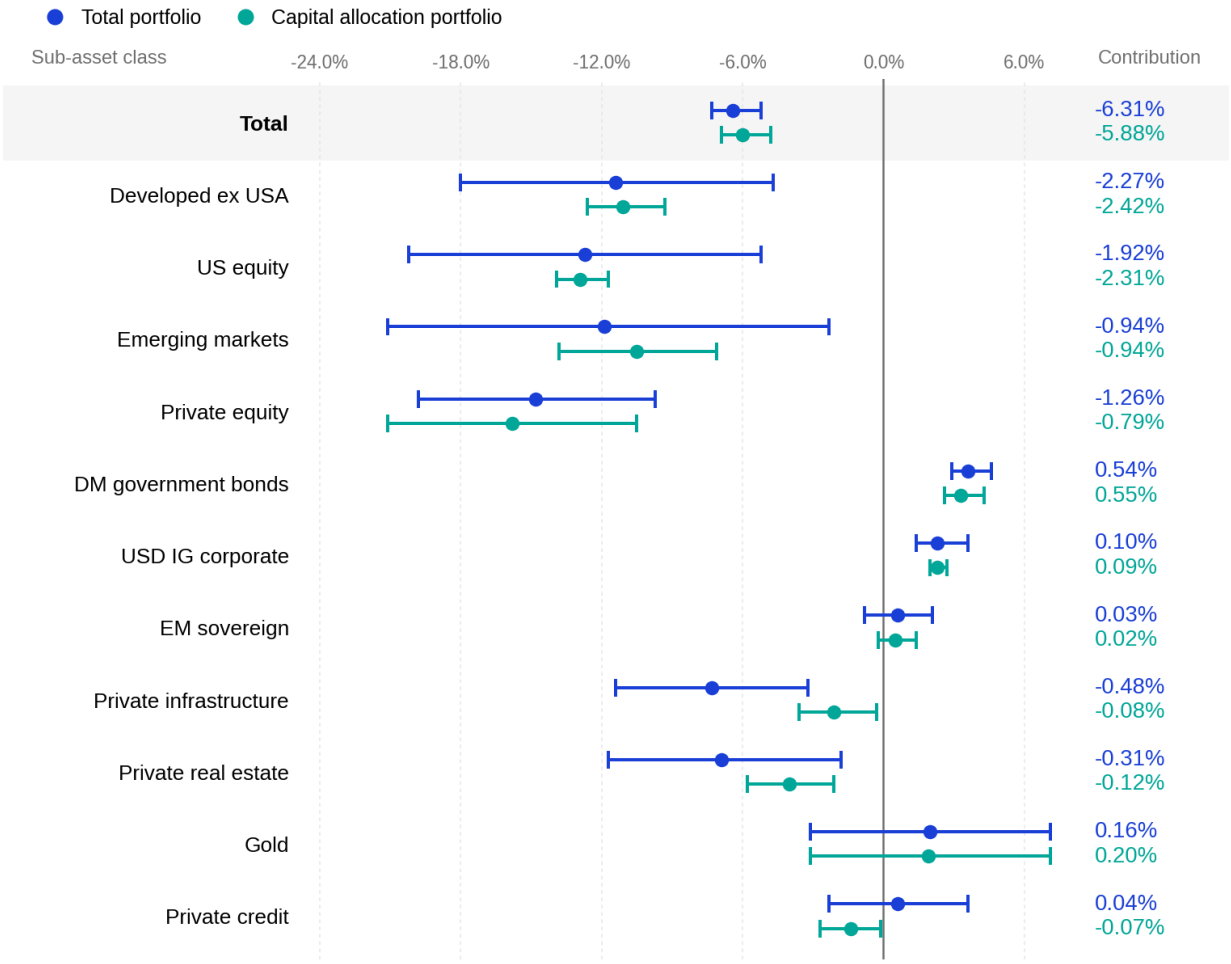
The total portfolio was more heavily hit by the recession scenario than the capital allocation portfolio



The whiskers represent the markets' expected returns and their uncertainty ranges. The contribution column is each sleeve's market return multiplied by its weight in the respective portfolio.

7.3 Act

The monitor and analyze stages show where the portfolio stands and what drives its risk. The act stage closes the loop by asking: given that picture, what do you do?

The stress test above exposed a real vulnerability to the recession scenario, which raises a natural question of whether the total portfolio could be made more resilient to it. That is exactly what a what-if analysis is for. The monitor stage had already located an equity beta concentration in the developed ex-U.S. sleeve, driven largely by information technology. The team tested a simple adjustment, cutting two percentage point from developed ex-U.S. information technology and add it to DM government bonds, a sleeve that has historically held up better under recessionary conditions.

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What-if scenario definition

Asset class / sub-asset class / sector / security	Current %	Current $M	Change %	What-if weight
▼ **Equity**	**43.00**	**21,500**	0	**41.00**
▼ **Developed ex USA**	20.00	10,000	0	18.00
▶ Financials	5.11	2,555	0	5.11
▶ Health care	3.01	1,504	0	3.01
▶ Industrials	2.93	1,465	0	2.93
▶ Information technology	2.59	1,293	−2	0.59
▶ Energy	2.02	1,009	0	2.02
▶ Materials	1.26	630	0	1.26
▶ Consumer staples	1.26	628	0	1.26
▶ Consumer discretionary	1.12	562	0	1.12
▶ Utilities	0.37	185	0	0.37
▶ Communication services	0.34	171	0	0.34
▶ **US equity**	15.00	7,500	0	15.00
▶ **Emerging markets**	8.00	4,000	0	8.00
▼ **Fixed income**	**22.50**	**11,250**	0	**24.50**
▶ **DM government bonds**	14.50	7,250	+2	16.50
▶ **USD IG corporate**	4.00	2,000	0	4.00
▶ **EM sovereign**	4.00	2,000	0	4.00
▶ **Private equity**	**8.50**	**4,250**	0	**8.50**
▶ **Commodities**	**8.00**	**4,000**	0	**8.00**
▶ **Private credit**	**7.00**	**3,500**	0	**7.00**
▶ **Private infrastructure**	**6.50**	**3,250**	0	**6.50**
▶ **Private real estate**	**4.50**	**2,250**	0	**4.50**

The adjustment reduced losses under both adverse scenarios, recession and stagflation, but it also gave up some of the upside in the benign one. That is the real value of a what-if tool. While it may not deliver a verdict, it proves a quick way to see the full trade-off a change may carry before committing to it.

What-if portfolio limited drawdown on adverse scenarios but gave up upside

Scenario	Total portfolio P&L	Capital allocation portfolio P&L	Reference portfolio P&L	DM-ex-US IT to DM-Govt Investment candidate
Stable outlook	+4.99% [4.1%, 5.8%]	+4.87% [4.0%, 5.7%]	+5.20% [4.6%, 5.8%]	+4.79% [4.0%, 5.6%]
Recession	−6.31% [−7.4%, −5.2%]	−5.88% [−7.0%, −4.8%]	−5.89% [−6.7%, −5.1%]	−5.87% [−7.0%, −4.8%]
Stagflation	−11.91% [−14.8%, −9.1%]	−12.01% [−14.7%, −9.3%]	−13.87% [−15.9%, −11.9%]	−11.82% [−14.6%, −9.1%]

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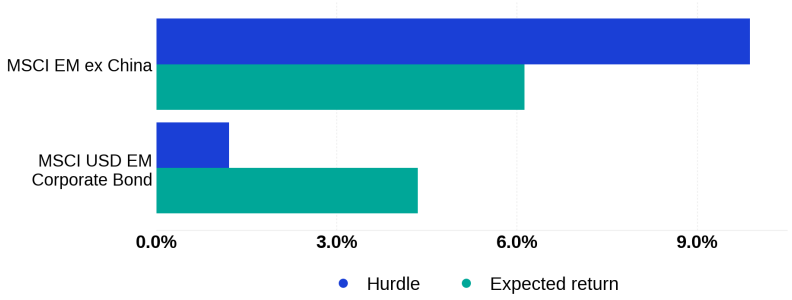
In terms of how the framework may help in evaluating new investment opportunities, two new ideas came in from different parts of the investment team. The equity team proposed emerging-market equities, excluding China, on the view that EM would outperform over the medium term and that the portfolio's existing China economic exposure, already larger than the stated weight implied, argued against adding more. The fixed-income team proposed emerging-market corporate bonds, arguing that spread levels were attractive and that a medium-term easing cycle would support EM credit valuations. The question was which candidate would actually improve the portfolio. Both would enter at the capital allocation layer, and we test their risk and return contribution there.

On standalone expected return, the equity candidate looked more attractive at 6.13% versus 4.35%.[13] Standalone return, however, was not the right lens in this case. The hurdle rate, the return a new position must earn to improve the portfolio given its marginal risk contribution, told a different story. EM ex-China equities carried a beta of 1.61 to the existing portfolio and correlated at 0.86 with what the fund already held. In an equity-heavy portfolio, more equity of any kind faced a steep bar. The hurdle came in at 9.88%, and the expected return fell well short. EM corporate bonds were a different proposition. At a 0.20 beta and 0.53 correlation, they offered genuine diversification against the equity-dominated book. Their hurdle was 1.21%, and their expected return cleared it comfortably. The candidate with the lower standalone return was the one that actually added value in portfolio context.

Hurdle rates put diversification benefit to a comparable scale to expected returns

Asset	Total risk (%)	Correlation	Beta to portfolio	Hurdle rate (%)	Expected return (%)
MSCI EM ex China	19.99	0.86	1.61	9.88	6.131
MSCI USD EM Corporate Bond	3.96	0.53	0.20	1.21	4.351



[13] The expected returns used here are illustrative. For markets natively covered, we used MSCI Macro-Finance Analyzer predictions as of Q1 2026. The remaining three markets' expected returns are propagated from those anchors following the Black-Litterman methodology.

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8 Conclusion

The common-language problem, measuring and comparing every investment on consistent terms across asset classes with historically incomparable risk metrics, has a tractable answer in the MAC factor framework. The framework is accessible at multiple stages of the TPA journey and across the range of portfolio architectures institutions have adopted, from those anchored to an index reference portfolio to those governed by an absolute return target. What matters is not the portfolio layer architecture but the analytical language they share.

The worked example in this paper illustrated the kinds of insight that language makes possible. Factor decomposition can reveal concentrations that asset-class labels obscure. Look-through analysis can show that a portfolio's true geographic footprint differs from its stated allocation. Correlation monitoring across horizons can help distinguish a passing dislocation from a lasting regime shift. Stress testing can measure the cost of portfolio drift before a real drawdown does. And hurdle-rate analysis weighs risk and return together, so the candidate with the highest expected return is not always the one that improves the portfolio the most on a risk-adjusted basis. None of these insights are available without a common analytical vocabulary that works across public and private assets, across governance layers and across the full cycle from monitoring to decision.

For private commitments, two models work side by side. The factor model shows what a private holding contributes to total portfolio risk and how the liquid sleeve can offset it. A cash-flow model shows how much an institution can commit and how fast to grow into it. Getting the second part wrong carries a real cost, since a portfolio can overcommit its way into a liquidity shortage, or leave capital idle. A comprehensive TPA framework needs both.

Part 3 of this series moves from the illustrative framework to institutional case studies, showing how different organizations applied these tools to live investment decisions.

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Appendix A: cross-asset factor models

The MSCI Multi-Asset Class (MAC) Factor Model decomposes portfolio returns into exposures to a set of systematic risk factors common across asset classes, plus an idiosyncratic residual specific to each holding. A relatively small number of factors — equity, rates, credit, currency, size and geography among the most important — collectively explain a large proportion of return variation across public equities, fixed income, real assets and private markets.

The MSCI MAC Factor Model organizes these factors in a tiered structure offering progressively finer levels of granularity (Shepard et al. 2020, Shepard 2025):

- **Tier 1** captures the broadest systematic drivers across the full asset class spectrum: equity, home bias, foreign currency, interest rates, credit, inflation, real estate, commodities and pure private equity. These are the dominant factors in any diversified institutional portfolio and the natural basis for board-level and strategic allocation discussions.
- **Tier 2** adds key systematic strategy factors such as value, momentum and carry across asset classes, alongside emerging-market equity, a cyclical versus defensive sector tilt and additional fixed-income and currency detail.
- **Tier 3** introduces equity regions, GICS sectors and the full suite of multi-asset systematic strategies across commodities, rates, credit and currencies. This is the level designed for evaluating active tilts and strategy exposures.
- **Tier 4** provides individual country, industry, key-rate duration and credit subsector factors across the global universe. This is the resolution used for tactical positioning and portfolio construction.
- **Local tier** operates through dedicated market-specific models, capturing country-level equity risk factors, industries, styles and market microstructure effects. All higher tiers are aggregated from this foundation, and the residual between any global tier and the local layer serves as a concentration warning.

This tiered structure supports TPA by serving different audiences simultaneously: the board at Tier 1, the CIO and total portfolio team at Tiers 2 and 3 and specialist teams at Tier 3, Tier 4 and local models.

Each private investment is modeled as carrying two categories of factor exposure. The first is the systematic, public factor space. That is, the same equity, rates and credit factors that drive listed market returns. These allow private assets to be compared to and risk-managed alongside public holdings within a single framework. The second category is pure private factors, systematic risk drivers specific to private markets. Pure private factors capture the portion of private asset risk and return that genuinely differentiates private from public investment and cannot be replicated through liquid market portfolios.

Together, public factor exposures and pure private factors allow total portfolio risk to be decomposed coherently across all asset classes, enabling investment teams to assess how a private commitment interacts with public holdings, identify genuine diversification and locate unintended factor concentrations.

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Appendix B: implied returns and hurdle rate methodology

Starting from a fund's current portfolio weights w, the implied returns are:

$$r = \lambda \Sigma w$$

where λ is the risk-aversion parameter, Σ is the asset covariance matrix. Equivalently, the implied return for any asset is proportional to its beta to the total portfolio:

$$r_i = r_p \cdot \beta_i,$$

where r_p is the portfolio expected return.

For a candidate investment not currently held in the portfolio, its implied return functions as a hurdle rate, the minimum expected return it must deliver to improve the portfolio's Sharpe ratio. (Agarwalla, Ruban and Melas 2025). For a private candidate the factor model-implied hurdle is only part of the test. An institution may also require a premium for the capital lock-up and for the governance cost of running a private allocation, so the effective bar sits some way above the model-implied number.

Appendix C: MSCI index coverage

The case studies in this paper use MSCI indexes as building blocks to represent portfolio allocations, derive factor exposures and benchmark private asset performance. This appendix provides a brief overview of the relevant index groups. The indexes serve illustrative and benchmarking purposes only and do not constitute investment recommendations.

- **Equity indexes.** MSCI's equity index suite covers developed, emerging and frontier markets across the full market capitalization spectrum — large, mid, small and microcap. The MSCI Global Investable Market Indexes methodology applies consistent rules across markets for security inclusion, free-float adjustment and rebalancing, making these indexes natural building blocks for reference and strategy portfolios where comparability and transparency are priorities. Regional, country and sector sub-indexes allow investment teams to decompose equity exposures at the level of granularity required for both governance reporting and factor analysis.
- **Fixed income indexes.** MSCI's fixed income index suite spans developed market government bonds, investment grade and high yield corporate bonds across major currencies and regions, with currency-hedged variants available for investors managing foreign exchange exposure. These indexes provide the rates and credit factor baseline within the reference portfolio and enable decomposition of fixed income allocations into their underlying duration, spread and currency exposures.
- **Real estate indexes.** MSCI's real estate index suite covers direct (unlisted) and listed real estate across major global markets, measuring performance at the property, fund and market level. These indexes allow institutional investors to benchmark real assets allocations against relevant peer groups and to assess the return contribution of real estate relative to its systematic.
- **Private capital indexes.** MSCI's private capital benchmarks cover private equity, private credit and infrastructure on a closed-end fund basis, drawing on fund-level cash flow and valuation data. Organized by strategy, geography and vintage year, these benchmarks support peer group comparison and public market equivalent analysis.

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