PEI

Scientific Infra & Private Assets

SIPA KNOWLEDGE CERTIFICATION · REQUIRED READING

Level 1 — Entry: Foundations

From First Principles: Indices, Benchmarks, Private Assets & Why They Are Hard to Value

LEVEL	FOCUS	PREREQUISITE	PRIMARY AUDIENCE
Entry	**Foundations**	**None**	**New users; all functions**

How to use this reading

This is the required curriculum for the Entry level. It assumes no prior finance background. Each module builds on the one before it: we start with simple ideas — what an index is, what a benchmark is, how an investment is valued — and only then turn to the harder questions of data quality and “return smoothing” that SIPA’s products address. Worked examples (in the shaded boxes) show the ideas with real figures from SIPA’s research. Sources are cited in the text as (Author, Year) and listed in full at the end. A short glossary is also provided.

What you should be able to do after this level

- Explain, in plain terms, what an index and a benchmark are and why investors use them.
- Describe how public (listed) and private (unlisted) assets differ, and why that difference matters for valuation.
- Explain what a NAV is and why valuing an unlisted asset is harder than valuing a listed one.
- Say why private markets need their own benchmarks, and what is wrong with the two usual shortcuts.
- Explain, in plain terms, what “return smoothing” is and why it understates risk.
- Describe at a high level how SIPA builds its indices, and name the main products and classification standards.

MODULE 1.1

What is an index? What is a benchmark?

An index is a single number that summarises the value of a group of things. A well-known example is a stock-market index: rather than watch the price of every company one by one, an investor can watch one number that rises and falls with the market as a whole. In finance, a market index is simply a portfolio — a weighted average of a representative set of assets that trade in a particular market. “Weighted” means some assets count more than others; for example, larger companies may carry more weight than smaller ones.

A benchmark is a yardstick. It is the standard you measure something against. If a fund returned 8% last year, was that good or bad? On its own, the number means little. Compared against a benchmark that represents its market, the 8% starts to have meaning. A benchmark lets you separate two different questions: “how did the market do?” and “how did this particular investment do, relative to the market?”

Worked example — what a benchmark tells you

Suppose a private-equity fund reports an 8% return for the year. By itself, 8% could be excellent or disappointing.

If a benchmark that represents the same market returned 6%, then, assuming the fund’s risk level is comparable to the market’s, roughly 6 percentage points of the fund’s result came simply from being in a rising market, and about 2 percentage points came from something the manager did differently. If instead the market returned 11%, the same 8% now looks weak — the fund lagged its market by about 3 points. The number 8% did not change; what changed is the yardstick. This “compared-with-what?” comparison is the entire purpose of a benchmark.

Investors use indices and benchmarks for several everyday purposes: to measure the performance of a fund or portfolio; to help decide how to split money across different types of assets (called “asset allocation”); and, sometimes, to calculate the fees a manager is paid. Regulators recognise these same uses in their formal definition of a benchmark.

Key idea: an index tells you how a market moved; a benchmark is that index used as a fair point of comparison. The two words are often used interchangeably, because a market index is the most common kind of benchmark.

MODULE 1.2

Public versus private assets

Not all investments are alike in how easily they can be bought, sold and priced. This single difference is the reason private markets are hard to benchmark.

Public (listed) assets. Listed assets — such as shares in a company quoted on a stock exchange — trade continuously. Many buyers and sellers meet in the market every day, so there is an observable price at almost any moment. If you want to know what a listed share is worth, you look it up. Because prices are observed constantly, measuring the return and the risk of a listed asset is straightforward.

Private (unlisted) assets. Private, or unlisted, assets are not quoted on an exchange. Two important examples for SIPA are unlisted infrastructure companies (for example an airport, a wind farm or a toll road held privately) and private-equity-owned companies (businesses owned by private funds rather than public

shareholders). These assets change hands rarely. SIPA's research notes that an unlisted infrastructure company may be sold only about once in its entire life — and many never are. Private companies transact only occasionally and irregularly, often in clusters when market conditions are favourable (Blanc-Brude & Tan, 2019).

This is the central complication. Because private assets seldom trade, there is usually no recent market price to read off a screen. Their value has to be estimated. Almost everything else in this reading follows from that one fact.

MODULE 1.3

How is an investment valued? Price and NAV

For a listed asset, valuation is easy: the value is the market price. For private assets and the funds that hold them, we need two more ideas.

Net Asset Value (NAV). A fund collects money from investors and uses it to buy assets. The Net Asset Value, or NAV, is the estimated value of the investments the fund still holds at a given date. Over the life of a fund, investors put money in ("contributions") and receive money back as investments pay out or are sold ("distributions"). The NAV is what remains, valued as of today. Contributions, distributions and the latest NAV together describe a fund's whole financial history — and, as the Advanced level shows, they are exactly the inputs needed to measure performance properly.

Estimating value when there is no market price. For an unlisted asset with no recent trade, someone must estimate its value. This estimate is called an appraisal. A common way to do this is to add up the future cash the asset is expected to pay its owners and then "discount" that future cash to a value today — because money in the future is worth less than money now. The rate used to do this is the discount rate, and it reflects how risky the asset is: riskier assets are discounted more heavily and are therefore worth less, all else equal.

Why the discount rate matters so much: for a long-lived asset such as a 25-year toll road, small changes in the discount rate move the estimated value a great deal, because they are applied to many years of future cash. So the quality of the discount rate — how well it reflects current market conditions — largely determines the quality of the valuation. A discount rate that is not kept up to date will produce a value that is quietly wrong.

MODULE 1.4

Why private markets need their own benchmark

To judge whether a private fund did well, you need a benchmark that represents the private market the fund actually invests in. For listed markets, good benchmarks have existed for decades. For private markets they are much harder to build, precisely because the underlying assets rarely trade. Historically, investors have relied on two shortcuts, and both are weak.

- **Appraisal-based indices.** These are built from the values that a group of managers report for their own assets. The index is only as good as those reported values — and, as the next module explains, those values have systematic problems.
- **Listed proxies.** Here a stock-market index of listed infrastructure or listed companies is used as a stand-in for the private market. But listed companies are not the same as private ones — they differ in

size, in sector mix, and in the kind of buyers and sellers involved — so the stand-in carries the wrong kind of risk and can mislead.

Worked example — why a listed stand-in misleads

SIPA compared the sector make-up of listed-infrastructure indices with the true unlisted-infrastructure universe (Amenc et al., 2017; SIPA CMA use-case notes). A widely used listed benchmark placed more than half its weight in transport, while transport is about a fifth of the unlisted universe; it held essentially no renewables, even though renewables are close to a fifth of the unlisted market.

SIPA also estimates that only around 100 genuinely infrastructure companies are listed worldwide, concentrated in a few energy, utility and airport names in a handful of countries. A benchmark built from such a narrow, mismatched set cannot represent the risk of a diversified private-infrastructure portfolio — so comparing a private fund against it answers the wrong question.

The rest of this reading explains why the shortcuts fall short and how a purpose-built private-market index avoids their problems.

MODULE 1.5

The data-quality problem, and “return smoothing”

Appraisal-based indices inherit two basic flaws from the way their data is collected.

- **Lack of representativeness.** The assets included are simply those that certain managers chose to report at a point in time, not a set chosen by any consistent rule. The membership keeps changing, so the index does not reliably represent the whole market.
- **Survivorship bias.** Only investments that are still active and still being reported appear. Failed or terminated investments quietly drop out, which flatters the picture the index paints.

Return smoothing. There is a subtler and more important problem. Appraised values are updated slowly and gently — often only once or twice a year — and they tend to change very little from one period to the next, even when the market has moved. As a result, the reported returns look unusually calm. The investment appears far less volatile, and therefore far less risky, than it truly is.

A simple analogy: imagine checking your home’s value only once every few years, and each time nudging last time’s figure up a little. Your wealth would look remarkably steady — not because house prices are steady, but because you rarely looked and rarely revised. Measuring less often, and revising gently, manufactures an illusion of stability.

Worked example — the “too good to be true” numbers

SIPA compared appraisal-based figures with market-based estimates for the same segment of contracted infrastructure projects (data to end-2020). The appraisal-based figures showed return volatility of only about 2% a year and an implied reward-for-risk (Sharpe ratio) of roughly 3.2 to 3.8.

For the same assets, SIPA’s market-based estimates showed volatility of about 7% to 11% and a Sharpe ratio of roughly 0.8 to 1.2 — economically believable numbers. A Sharpe ratio much above 1, sustained for years, is essentially never seen in real markets; a value near 3 would imply an almost free lunch. A related tell-tale sign is that appraisal returns are strongly correlated from one period to the next (about 40% for one widely used private index), whereas genuine market returns are not (Amenc et al., 2020).

The correct conclusion is not that these assets are nearly risk-free. It is that the reported numbers understate their true risk.

MODULE 1.6

A better approach: the calculated, model-based index

SIPA's answer is a calculated index. Instead of collecting the values that managers happen to report, a calculated index computes a fresh price for every asset in its universe using one consistent method, updated every month.

The plain-English version of the method is this. From the private-market transactions that do occur, SIPA learns what buyers are currently paying for common company characteristics — for example size, profitability, and how much debt a company carries. It then applies that up-to-date market information to every company's own characteristics to estimate a fair, current value, even for companies that have not traded recently. This estimated value is often called a "shadow price" (Blanc-Brude & Tan, 2019). The mechanics are the subject of the Intermediate level; what matters here is that the method produces a price for every asset, by rule, every month.

> **Worked example — does the model actually match real prices?**
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> In 2010, an infrastructure fund bought a 50% stake in the UK's M40 motorway concession. SIPA's model, using only the road's financial characteristics and the market price of risk at the time, estimated an equity value of about USD 116.3m against a reported transaction value of about USD 115.5m — a difference of well under 1%. On the key valuation multiples (price-to-sales, EV/EBITDA) the model was within roughly 1% of the observed deal (SIPA methodology notes).

The point is not the precise figures but the principle: a consistent model, calibrated to real transactions, can reproduce the prices that actually occur in the market. That is what makes a calculated index trustworthy.

Because every asset is priced the same way, every month, a calculated index is:

- **Representative** — it covers a defined universe of assets chosen by rule, not just those that happened to be reported.
- **Consistent and transparent** — one documented method is applied to all assets over time.
- **Up to date** — values reflect current market conditions rather than last year's appraisal.
- **Not smoothed** — so it shows a realistic picture of risk, which investors need in order to manage and report it properly. SIPA's calculated indices show believable Sharpe ratios (below 1) and no period-to-period correlation, unlike contributed appraisal indices.

MODULE 1.7

SIPA's products

SIPA applies this approach across two product lines, one for each of its markets.

infraMetrics — unlisted infrastructure. infraMetrics covers a large universe of private infrastructure companies (thousands identified across around 25 countries), from which several hundred representative companies are priced every month, with history reaching back around twenty years. It provides asset-level valuation figures and a family of market indices. Its flagship broad-market index is the infra300; the infra100 and infraGreen families cover, respectively, the largest companies and renewable-energy companies.

privateMetrics — private equity. privateMetrics covers a much larger universe of private companies globally and produces a broad set of private-equity indices. Its main broad-market indices are the

private2000 and the private3000, alongside regional indices such as privateUSA, privateEurope and privateAsia, and many thematic indices. In total the two product lines publish dozens of headline indices and, on request, many finer segment indices.

Both flagship indices — infra300 and private2000 — are registered with the European securities regulator (ESMA) as benchmarks, are updated monthly, and are overseen by a dedicated Index Committee. Importantly, they measure the market itself — before any manager's fees or choices — which is exactly what makes them fair benchmarks.

MODULE 1.8

Organising the market: classification standards

To compare like with like, you first need a way to sort companies into sensible groups — a filing system. Grouping companies well matters because companies in the same well-defined group tend to move together in value; academic work on industry classification shows that good groupings produce stronger within-group co-movement and cleaner comparisons than ad hoc groupings (Chan, Lakonishok & Swaminathan, 2007). SIPA maintains two such standards, one per market.

TICCS — for infrastructure. TICCS (The Infrastructure Company Classification Standard) sorts infrastructure companies along four independent dimensions, called pillars:

- **Business Risk** — how predictable the company's revenues are (for example Contracted, Merchant or Regulated).
- **Industrial Activity** — what the company actually does (for example power, transport, renewables).
- **Geo-economic exposure** — where it operates.
- **Corporate Structure** — how it is set up (a standalone corporate versus a single-project company).

PECCS — for private equity. PECCS (The PrivatE Company Classification Standard) sorts private companies by fundamental characteristics rather than industry alone, across five pillars: Activity, Lifecycle phase, Revenue model, Customer model and Value chain.

You do not need to memorise every class at this level. The point to take away is that these standards let SIPA divide each market into comparable segments — the essential first step before any index or benchmark can be built. Different segments really do trade at different prices: for example, across private-equity segments SIPA reports quite different valuation multiples and returns by activity and revenue model, which is exactly why the segments are treated separately. The pillars are covered in detail at the Intermediate level.

Glossary

Term	Plain-language meaning
Index	A single number summarising the value of a group of assets; a portfolio expressed as one figure.
Benchmark	A yardstick used for comparison — usually a market index — answering "compared with what?"
Listed / public asset	An asset traded on an exchange, with an observable price.

Term	Plain-language meaning
Unlisted / private asset	An asset not traded on an exchange; it trades rarely and must be valued by estimate.
NAV (Net Asset Value)	The estimated value of the investments a fund still holds at a given date.
Contribution / distribution	Money paid into a fund by investors / money returned to them.
Appraisal	An estimate of an asset's value made when there is no recent market price.
Discount rate	The rate used to convert expected future cash into a value today; higher for riskier assets.
Volatility	How much a value moves up and down over time; a common measure of risk.
Sharpe ratio	Reward per unit of risk (excess return divided by volatility); values much above 1 are rare and short-lived.
Return smoothing	The false appearance of stability caused by valuing assets rarely and revising gently.
Survivorship bias	A distortion from including only surviving investments and dropping failed ones.
Calculated index	An index whose prices are computed by one consistent method, not collected from managers.
Shadow price	A model-based estimate of an asset's current fair value.
TICCS / PECCS	SIPA's classification standards for infrastructure / private-equity companies.

References

SIPA documentation (curriculum basis)

Scientific Infra & Private Assets. Methodology and Valuation Notes; Product & Index Factsheets; privateMetrics Index Reports; Performance and Benchmarking Research; Strategic Allocation and CMA Use Cases; Product Presentations. 2024–2025.

Peer-reviewed and institutional references cited in the SIPA documents

Chan, L. K. C., Lakonishok, J., & Swaminathan, B. (2007). Industry classifications and return comovement. Financial Analysts Journal, 63(6), 56–70. https://doi.org/10.2469/faj.v63.n6.4927

Fama, E. F., & French, K. R. (2010). Luck versus skill in the cross-section of mutual fund returns. The Journal of Finance, 65(5), 1915–1947. https://doi.org/10.1111/j.1540-6261.2010.01598.x

Blanc-Brude, F., & Tan, M. (2019). What factors explain the valuation of unlisted infrastructure companies? Scientific Infra & Private Assets research paper. https://www.scientificinfra.com

Amenc, N., Blanc-Brude, F., et al. (2017). Assessing listed infrastructure as a proxy for unlisted infrastructure. Scientific Infra & Private Assets research. https://www.scientificinfra.com

Amenc, N., Blanc-Brude, F., et al. (2020). The volatility of unlisted infrastructure equity. Scientific Infra & Private Assets research. https://www.scientificinfra.com

Full technical treatment of the pricing model, the classification pillars and index construction is given in the Intermediate reading; the use of these indices to measure fund performance is given in the Advanced reading.