Index equity: tilts, designs, vehicles and replication

Portfolio Management

1 A story: the shopping basket

- Cap-weighted: hold the market as it is
- Weights follow prices, so trading is low
- Factor tilt: lean towards value, size, momentum
- A tilt is a bet that a premium will be paid

IN THE LESSON

- Picture a shop that sells one giant basket holding a little of everything on the shelves, in proportion to how much shoppers spend on each item.
- That is a market-cap-weighted index fund.
- It holds the market as it is.
- Nobody has to decide anything, and because the weights follow prices, almost nothing needs trading.
- Now a shopper says: I will lean my basket towards cheap, sturdy items, because they have rewarded patient shoppers.
- That is a factor tilt.
- Marlow Pension Trust holds the plain basket today.
- Its trustees ask whether a value tilt, which favours cheaply priced shares, would be better.
- Anika Rao must contrast the two and defend a recommendation.

2 Cap-weighted against factor-tilted

Same universe, two ways to weight it

Feature	Verdict
Cap-weighted: turnover	Low
Factor-tilted: turnover	Higher
Factor-tilted: capacity	Limited
Factor-tilted: key risk	Tracking error

IN THE LESSON

- Here is the contrast in four lines.
- Market-cap weighting rebalances itself, because weights follow prices.
- So turnover is low, and capacity is high, which means very large sums can go in without moving prices.
- It also mirrors the holdings of the average investor.
- Its weakness is that it piles weight into the biggest, and possibly overpriced, shares.
- Factor-based indexes, often called smart beta, follow clear rules that tilt towards value, size, momentum, quality or low volatility.
- They stay transparent and cheaper than an active manager.
- But they trade more, their capacity is limited, popular factors can become crowded, and they can trail the market for years.
- The risk to watch is tracking error against a broad cap-weighted benchmark.

3 How passive is each choice?

- Cap-weighted
- Equal-weighted
- Single factor tilt
- Several factors
- Active manager

IN THE LESSON

- Is a factor fund passive?
- Look at this line, from accepting the market on the left to backing a view on the right.
- Plain cap weighting sits at the far left.
- Equal weighting is a mild departure.
- A single factor tilt sits near the middle, because someone chose the factor, defined it and set the rebalancing rule.
- Those are active decisions, even though a computer then follows the rules.
- A fund that mixes several factors sits further right still.
- At the far right is a fully active manager, who picks individual shares.
- This is the exam trap.
- The fund is cheap and rule-based, but it is not purely passive, so judge it against a cap-weighted benchmark and not on its own.

4 Ahead over the cycle, behind for years

Chart: Relative wealth vs Years

- Cap-weighted market
- Value tilt
- Years behind

IN THE LESSON

- Now the picture.
- The horizontal axis is time in years, and the vertical axis is the wealth of a value-tilted index relative to the market.
- The flat grey line is the cap-weighted market.
- Measured against itself, it never moves.
- The curve is the value tilt.
- It starts level, climbs, then slides below the grey line for a long stretch in the middle.
- Those are the years in which a committee would see a so-called passive fund trailing the market.
- Then it recovers and ends well ahead.
- This is an illustration, not real data.
- The lesson is patience.
- A premium, if it comes, arrives unevenly, and a trustee who sells in the long dip locks in the loss.

5 Judging a tilt: reward and scale

IR = active return ÷ tracking error
Blend TE = tilted share × TE

Active return	Return above the benchmark
Tracking error	Volatility of the difference
Information ratio	Reward per unit of active risk
Tilted share	Part of the fund that is tilted

IN THE LESSON

- Two tools help Anika judge a tilt.
- The first is the information ratio.
- Take the expected active return, which is the return above the cap-weighted benchmark, and divide it by the tracking error, the volatility of that difference.
- It says how much reward each unit of active risk brings.
- The second tool shows how tracking error scales when only part of the portfolio is tilted.
- The cap-weighted part matches the benchmark and adds none, so the blend's tracking error is the tilted share times the tilt's own tracking error, in a simple split like ours.
- The expected active return scales the same way, which is why a half tilt halves both.

6 Example 1: what is the tilt worth?

Cap fund 0.05% a year; tilt fund 0.25%; illustrative

Assumed value premium	per year	**1.5%**
Extra trading cost	tilt trades more	**−0.3%**
Extra fee	0.25% − 0.05%	**−0.2%**
Net expected active return	1.5 − 0.3 − 0.2	**1.0%**
Information ratio	1.0 ÷ 4.0	**0.25**

IN THE LESSON

- Marlow holds a cap-weighted fund costing point zero five per cent a year.
- A value-tilted fund costs point two five.
- Assume a value premium of one point five per cent a year, extra trading costs of point three, and tracking error of four per cent against the cap-weighted index.
- Take the premium of one point five, subtract point three of extra trading, and subtract point two for the higher fee, which is the gap between the two fees.
- The net expected active return is one point zero per cent.
- Divide by the tracking error of four and the information ratio is point two five.
- Remember that the premium is an assumption, and not a promise.

7 Example 2: propose and defend

Board's active risk budget: 3% tracking error

Bad year for the tilt	1.0% − 4.0%	**−3.0%**
Full switch: tracking error	over the 3% budget	**4.0%**
Half tilted: tracking error	0.5 × 4.0%	**2.0%**
Half tilted: active return	0.5 × 1.0%	**0.5%**
Recommendation	inside the budget	**Half**

IN THE LESSON

- Now the decision.
- In a bad year, one standard deviation down, the tilt returns one point zero less four point zero, which is minus three per cent against the market.
- A full switch carries tracking error of four per cent, over the board's active risk budget of three.
- So Anika proposes a blend, half tilted and half cap-weighted.
- Its tracking error is half of four, which is two per cent, inside the budget.
- Its expected active return is half of one point zero, which is point five per cent.
- She records this as an active decision.
- What could go wrong?
- Several years of trailing the market, so the trustees must accept that before they begin.

8 A story: same shop, different shelf rules

- Pick the segment: market, size, style, region, sector
- Then the rules: who is in, how often it changes
- Then the weighting: how much shelf each stock gets
- Every rule has a trading cost

IN THE LESSON

- Two funds can both call themselves passive large-cap funds and still hold very different baskets.
- The difference is set before any trading, by the rules of the index each one follows.
- Think of a shop with rules.
- Which items may be stocked?
- How often is the list changed?
- And how much shelf does each item get?
- Anika Rao works through them in order.
- First she picks the market segment the client wants: broad market, a size band, a style, a region or a sector.
- Then she picks an index whose method fits.
- Every rule has a cost, and the cost shows up as trading, which drags on the fund year after year.

9 Choosing an index, step by step

Make three choices

Pick the segment → Set the rules → Choose the weighting

Then test the fit

Investable? → Right exposure? → Cheap to hold?

IN THE LESSON

- Here is the process as a flow.
- In the top row, Anika makes three choices.
- First the segment, which is the exposure the client actually wants.
- Second the methodology, which covers how stocks are selected and how often the index is reconstituted, meaning its list of members is rebuilt.
- Third the weighting scheme.
- The bottom row tests the choice.
- Is the index investable, with stocks that can be bought in size without moving the price?
- Does it match the exposure wanted, rather than something quietly different?
- And can it be held cheaply?
- An index that fails the first test fails the others, because thin trading and frequent changes raise costs and tracking error.

10 Four ways to weight

Same stocks, four weighting rules

Weighting	Main trait
Float cap	Low turnover
Price	A quirk
Equal	Small-cap tilt
Fundamental	Value tilt

IN THE LESSON

- There are four common weighting schemes.
- Float-adjusted cap weighting counts only shares that investors can actually buy, so it is liquid and low in turnover, and weights follow prices with no trade needed.
- Price weighting gives the most weight to shares with the highest price, whatever the size of the company.
- It is a historical quirk.
- Equal weighting gives every stock the same weight.
- That tilts towards smaller companies, and it needs frequent rebalancing to restore the equal weights.
- Fundamental weighting uses sales, earnings or book value instead of price, and tends to tilt towards value.
- A sound choice matches the exposure the client wants and can be held cheaply.

11 One stock, three weights

Weight of stock B (%)

Float cap	**66.7**
Price	**11.8**
Equal	**33.3**

Stocks A, B and C; B is the largest company

IN THE LESSON

- Here is the same stock under three rules.
- The vertical axis is the weight of stock B, in per cent.
- B has the lowest share price but is the largest company.
- Under float-adjusted cap weighting it is sixty six point seven per cent of the index, the first and tallest bar.
- Under price weighting, the middle bar, B gets only eleven point eight per cent, because its share price is low, even though it is the biggest firm.
- Under equal weighting, the last bar, it gets thirty three point three.
- Same company, same day, three very different portfolios.
- Which one is right depends on what the client wants to own, and what it costs to hold.

12 Example 3: three stocks, three rules

A $100, 10m shares; B $20, 150m; C $50, 20m, half family

Float-adjusted values	A, B, C in millions	**1,000 3,000 500**
Float cap weights	out of 4,500m	**22.2 66.7 11.1**
Price weight of A	100 ÷ 170	**58.8%**
Equal weights, B rises 10%	B drifts to 110 of 310	**35.5%**
Rebalancing trade	35.5% − 33.3%	**sell 2.2%**

IN THE LESSON

- Anika tests the rules on three stocks.
- A trades at one hundred dollars with ten million shares.
- B trades at twenty with a hundred and fifty million shares.
- C trades at fifty with twenty million shares, half held by a founding family.
- The float-adjusted values are one thousand million for A, three thousand million for B, and five hundred million for C, because only half of C counts.
- That gives weights of twenty two point two, sixty six point seven and eleven point one per cent.
- Price weighting gives A fifty eight point eight.
- Now equal weights and a ten per cent rise in B.
- B drifts to thirty five point five per cent, and the fund must sell about two point two per cent of itself to restore balance.

13 Example 4: the price of poor investability

Drag = turnover × cost of trading; Marlow's core: $1,200m

Float cap index	4% × 0.30%	**0.012%**
Equal-weighted index	25% × 0.30%	**0.075%**
Thinly traded index	40% × 0.80%	**0.320%**
Extra drag on $1,200m a year	0.308% × 1,200m	**3.7m**

IN THE LESSON

- Now the trap: ignoring investability.
- The cost of an index to the fund is turnover times the cost of trading.
- Suppose three candidate indexes.
- The float cap index turns over four per cent a year, and trades cost point three per cent.
- The drag is point zero one two per cent.
- The equal-weighted index turns over twenty five per cent at the same cost, so the drag is point zero seven five.
- A third index, full of thinly traded names, turns over forty per cent, and trades there cost point eight.
- Its drag is point three two per cent.
- That is point three zero eight more than the float cap index, which on one point two billion dollars is about three point seven million dollars every year.
- The cheapest index to follow is not always the one with the best story.

14 A story: three doors to one room

- Door one: pooled fund, mutual fund or ETF
- Door two: derivatives, futures or swaps
- Door three: separately managed account
- Same exposure; cost, tax and control differ

IN THE LESSON

- Once Marlow has chosen the index, there is still the question of how to hold it.
- Think of three doors into the same room.
- The first door is a pooled fund, where many investors share one portfolio, such as an index mutual fund or an exchange-traded fund.
- The second door is derivatives, where the investor buys the index return through contracts, such as futures or swaps, without owning the shares.
- The third door is a separately managed account, where the investor owns the shares directly, in an account of its own.
- The exposure behind the doors is the same.
- What changes is cost, tax, speed, and how much the investor can customise.

15 How the vehicles differ

Four ways to hold the same index

Vehicle	Key feature
Index fund	Once a day
ETF	Trades all day
Futures or swap	Roll, margin
Separate account	Customised

IN THE LESSON

- Here are the main features.
- An index mutual fund deals once a day, at net asset value, and the price is set at the end of the day.
- An exchange-traded fund, or E T F, trades all day on an exchange.
- Its in-kind creation and redemption, meaning that big holders swap units for baskets of shares instead of cash, often make it tax-efficient, notably in the United States.
- Futures and swaps are quick to put in place and are capital-efficient.
- But futures must be rolled as contracts expire, carry basis risk, and call for margin.
- Swaps also add counterparty risk.
- A separately managed account holds the shares directly, so it can be customised, but it needs scale and adds custody and administration cost.

16 How an ETF stays in line with its index

Creation

Dealer delivers shares → Fund issues units → Units trade on exchange

Redemption

Dealer returns units → Fund hands back shares → Few gains realised

IN THE LESSON

- Here is the ETF mechanism, because it explains the tax point.
- Look at the top row first.
- A big dealer delivers a basket of the index shares to the fund, and in exchange the fund issues new ETF units, which then trade on the exchange.
- Now the bottom row.
- When the dealer wants to redeem, it hands units back, and the fund returns shares in kind, rather than selling them for cash.
- Because the fund seldom has to sell shares to meet redemptions, it seldom realises gains, which is why ETFs are often tax-efficient.
- This benefit matters most to taxable holders.
- Marlow is tax-exempt, so for Marlow the tax edge is worth little.

17 Example 5: a futures bridge

Index 5,000; multiplier $50; $500m for 3 months

Notional per contract	5,000 × $50	**$250,000**
Contracts needed	$500m ÷ $250,000	**2,000**
Margin at an assumed 5%	5% × $500m	**$25m**
Cash left to earn interest	$500m − $25m	**$475m**

IN THE LESSON

- Marlow has five hundred million dollars in cash for about three months, while it hires a new active manager.
- Index futures stand at five thousand with a multiplier of fifty dollars, so one contract has a notional value of two hundred and fifty thousand dollars.
- Five hundred million divided by two hundred and fifty thousand gives two thousand contracts.
- Futures need margin, the deposit that backs the position.
- At an assumed five per cent, that is twenty five million, and the other four hundred and seventy five million stays in cash.
- Futures are quick, cheap and easy to close.
- The risks are basis risk, because the future may not track the index exactly, and margin calls if prices fall.

18 Example 6: when futures stop being cheaper

ETF dealing 0.10% each way; futures roll 0.05%

3 months: ETF in and out	2 × 0.10%	**0.20%**
3 months: futures roll cost	no roll needed	**0.00%**
2 years: futures roll cost	8 × 0.05%	**0.40%**
2 years: ETF in and out	2 × 0.10%	**0.20%**
2 years: futures cost more by	0.40 − 0.20	**0.20%**

IN THE LESSON

- Futures win for a short bridge.
- Suppose an E T F costs point one per cent each way to buy and to sell, and a futures roll costs point zero five per cent.
- For three months, the E T F costs point one twice, which is point two per cent.
- The futures need no roll, because one contract runs to the end of the bridge, and we ignore their small dealing costs.
- Now suppose the bridge stretches to two years.
- Futures would be rolled every quarter, eight rolls at point zero five, which is point four per cent.
- The E T F still costs point two.
- So the gap flips, and the futures cost point two per cent more.
- What could go wrong?
- A bridge planned for three months that drags on, so the choice must be revisited.

19 Matching the need to the vehicle

Marlow's three needs

Need	Vehicle
Staff plan, $2m, taxable	ETF
Core $1,200m, exclusions	Own account
Bridge $500m, 3 months	Futures
Daily dealing, small	Index fund

IN THE LESSON

- Now the decision.
- Size, horizon, customisation and tax drive the choice, so Anika matches each of Marlow's needs.
- First, a two million dollar staff savings plan, held for a long time by taxable members.
- A pooled E T F is cheap, small enough to afford, and often tax-efficient.
- Second, the one point two billion dollar core, which the trustees want to run without tobacco and controversial weapons.
- A separately managed account can drop named stocks, and at this size it is affordable.
- Third, the five hundred million dollar bridge for three months.
- Futures put the cash to work quickly and are closed when the new manager is funded.
- A small holder that only needs daily dealing could use an index mutual fund.
- Each choice is a trade of cost for control, and each has its own risks.

20 Mistakes to avoid so far

- Calling a factor fund purely passive
- Judging a factor on a few bad years
- Choosing an index and ignoring turnover
- Thinking equal weighting is free
- Treating futures as free exposure

IN THE LESSON

- Let us collect the common mistakes from the first three topics.
- One: calling a factor fund purely passive, when choosing the factor, its definition and its rebalancing rule are active decisions.
- Two: judging a factor on a few bad years, when premiums arrive unevenly and a long dip is normal.
- Three: choosing an index by its story and not its turnover, which ignores investability and trading costs.
- Four: believing equal weighting is free, when it needs constant rebalancing.
- Five: treating futures as free exposure, when they must be rolled and bring basis risk and margin calls.
- In every case, ask what the choice costs and what could go wrong.

21 A story: copying a map

- Trace every street: full replication
- Draw a sample of streets in each district
- Let a formula pick the streets: optimisation
- Weigh closeness against cost

IN THE LESSON

- Suppose you must copy a huge map of a city.
- You could trace every street, and the copy would be perfect, but it would take forever, and the tiny alleys would cost more to draw than they are worth.
- You could instead draw the main roads and a sample of side streets in each district, so that each district looks right.
- Or you could use a formula that picks the few streets which matter most.
- These are full replication, stratified sampling and optimisation.
- Marlow also holds a small-cap segment with a great many stocks, many of them thinly traded.
- Anika must weigh closeness to the index against the cost of getting there.

22 Three ways to copy an index

Three ways to copy an index

Replicate: hold every stock →

Sample: a few per cell →

Optimise: let a model pick

IN THE LESSON

- Here are the three methods in a row.
- Full replication holds every stock in the index at its index weight.
- It gives the lowest tracking error and suits indexes with a modest number of liquid stocks.
- Stratified sampling divides the index into cells, for example by sector and by size, and holds a few stocks in each cell, so that each cell's weight matches the index.
- It suits broad indexes and smaller portfolios.
- Optimisation uses a factor risk model to choose the holdings that minimise expected tracking error.
- It copes with very large universes, but it relies on past covariances, which change, so it must be re-optimised regularly.

23 Which method suits which index

Pick the method to fit the index

Method	Best when
Full replication	Few liquid names
Stratified sampling	Broad, small fund
Optimisation	Huge universe
Trap	Replication always best

IN THE LESSON

- Now compare them side by side.
- Replication fits an index with few, liquid names, because holding everything costs little and the tracking error is almost zero.
- Stratified sampling fits a broad index and a smaller fund, where tiny positions in illiquid names would cost more than they are worth.
- Optimisation fits a large universe, but it is only as good as its risk model, and the history it uses.
- The trap is to assume replication is always best.
- With many illiquid constituents, its trading costs can outweigh the sampling error it removes.
- Anika must therefore put the index, the fund's size and the liquidity of the smallest names in front of her, and not just ask which method gives the lowest tracking error.

24 Example 7: building a sample by cells

Index of 2,000 stocks; sectors × size bands

Cells (sector × size)	10 × 3	**30**
Healthcare cell in the index	38 stocks	**9.6%**
Stocks held in the cell	6 of 38	**6**
Weight of each, equal	9.6% ÷ 6	**1.6%**
Cell weight matches	6 × 1.6%	**9.6%**

IN THE LESSON

- Here is how stratified sampling works for Marlow's small-cap index.
- Anika divides the index into ten sectors and three size bands, which makes thirty cells.
- Take the healthcare cell.
- It holds thirty eight stocks, and makes up nine point six per cent of the index.
- She does not buy all thirty eight.
- She buys six, in equal weights.
- Nine point six divided by six gives one point six per cent each.
- Check the sum: six times one point six is nine point six, so the cell weight in the portfolio matches the cell weight in the index.
- Repeat that in every cell, and sector and size exposures match the index, even though most stocks are left out.
- What could go wrong is stock-specific risk, because the six may not behave like the many stocks left out.

25 Closeness against cost

Chart: Cost (%) vs Share of index stocks held

- Tracking error
- Trading cost

IN THE LESSON

- Now the picture.
- The horizontal axis is the share of the index's stocks that the fund holds.
- The vertical axis is the yearly cost, in per cent.
- The red curve is tracking error.
- It falls as the fund holds more names, and it is smallest at full replication on the right.
- The gold curve is trading cost.
- It rises with the number of names, because the last stocks added are small and thinly traded, so each is expensive to buy and to rebalance.
- The two curves cross, and the best fund sits where their sum is smallest, not at either end.
- This is an illustration of the idea.
- For a broad, illiquid index the best point is well short of holding everything.

26 Closeness and cost in one number

Average shortfall = trading cost
Bad-year shortfall = trading cost + TE

Trading cost	Lost every single year
Tracking error	Size of one bad swing
Bad-year shortfall	Cost plus one bad swing

IN THE LESSON

- A single rule lets us compare methods.
- Each year the fund loses its trading cost, and it loses it every time.
- On top of that, tracking error measures how far the fund may stray from the index, up or down.
- In a bad year, one standard deviation below the average, the shortfall is the trading cost plus the tracking error.
- Average shortfall tells us what we lose in an ordinary year.
- Bad-year shortfall tells us the pain in a poor one.
- A sensible manager looks at both.
- One caution: this uses the tracking error as the size of one bad swing, and the real distribution could be wider, so treat it as a rough guide and not a guarantee.

27 Example 8: replication or sampling?

$50m fund; 2,000 stocks; the smallest 1,000 thinly traded

Replication, average shortfall	cost only	**−0.60%**
Sampling, average shortfall	300 stocks, cost only	**−0.15%**
Replication, bad year	−0.60 − 0.05	**−0.65%**
Sampling, bad year	−0.15 − 0.40	**−0.55%**
Sampling's edge on average	0.60 − 0.15	**0.45%**

IN THE LESSON

- Marlow's small-cap fund is fifty million dollars and tracks an index of two thousand stocks, the smallest thousand thinly traded.
- Full replication is expected to track within point zero five per cent a year but cost point six zero per cent a year in trading.
- Stratified sampling with three hundred stocks costs point one five, with tracking error of point four zero.
- On average, replication trails the index by point six, and sampling by point one five.
- In a bad year, replication trails by point six five and sampling by point five five.
- So sampling wins on average by point four five, and even in a bad year it still trails by less.
- What could go wrong is tracking error swinging against the fund, which sampling accepts.

28 Bad-year shortfall by method

Bad-year shortfall (%)

Replication	**0.65**
Sampling	**0.55**
Optimisation	**0.47**

Optimisation: cost 0.12% + error 0.35%

IN THE LESSON

- Add optimisation to the picture.
- The vertical axis is the shortfall against the index in a bad year, in per cent, so a shorter bar is better.
- The first bar is full replication at point six five.
- The second is stratified sampling at point five five.
- The third is optimisation at point four seven, which comes from a trading cost of point one two and tracking error of point three five.
- A risk model can reach a similar tracking error with fewer names, so it can edge out sampling.
- But the model is built on past covariances, so the fund must re-optimise as markets change.
- Marlow's choice is between the second and third bars, and the case for either rests on that care.

29 Example 9: when replication wins

100 liquid large caps; illustrative

Replication: cost + error	0.05% + 0.02%	**0.07%**
Sampling: cost + error	0.03% + 0.30%	**0.33%**
Replication's edge here	0.33 − 0.07	**0.26%**
Sampling's edge on small caps	0.65 − 0.55	**0.10%**

IN THE LESSON

- To be fair to replication, consider a different index of a hundred liquid large caps.
- Holding all hundred costs very little, because the stocks trade in size at narrow spreads.
- Replication costs point zero five per cent a year and has tracking error of point zero two.
- Sampling would hold fewer names, cost point zero three, and track with an error of point three zero.
- In a bad year, replication trails by point zero seven per cent, sampling by point three three.
- Replication is ahead by point two six.
- The rule is not that one method always wins.
- It is that the answer depends on how many names the index holds, how easily they trade, and how big the fund is.
- That is the decision to defend.

30 Recap: the lesson in five lines

- Cap-weighted is the default; a tilt is an active bet
- Choose the index by segment, rules, weighting
- Vehicle: size, horizon, customisation, tax
- Replication, sampling, optimisation: closeness against cost
- Say what to do, why, and what could go wrong

IN THE LESSON

- Let us pull the lesson together.
- First, cap weighting is the self-rebalancing default, while factor tilts add a premium but also tracking error, turnover and long dips, so they are active decisions.
- Second, an index is chosen by segment, rules and weighting, and a sound one is investable, because thin trading raises costs.
- Third, the vehicle depends on size, horizon, customisation and tax: pooled funds, derivatives or a separate account.
- Fourth, replication gives the lowest tracking error, but sampling or optimisation can win when many names are illiquid.
- Fifth, always weigh closeness against cost, and say what could go wrong.
- That is how to propose and defend a choice.

31 Try three quick questions

1. Premium 2.0%, costs 0.6%, tracking error 4%. Information ratio?
   Answer: (2.0 − 0.6) ÷ 4 = 0.35.
2. Futures 4,000, multiplier $50. Contracts for $100m?
   Answer: $100m ÷ (4,000 × $50) = 500 contracts.
3. Replication 0.50% + 0.05%; sampling 0.10% + 0.30%. Smaller bad-year shortfall?
   Answer: Sampling: 0.40% against 0.55%, better by 0.15%.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- A tilt fund has an expected premium of two per cent, extra costs of point six per cent in all, and tracking error of four per cent.
- What is the information ratio?
- Two less point six is one point four, divided by four, so the answer is point three five.
- Question two.
- Index futures stand at four thousand with a multiplier of fifty dollars.
- How many contracts put a hundred million dollars to work?
- One contract is two hundred thousand dollars, so the answer is five hundred contracts.
- Question three.
- Replication costs point five zero with tracking error of point zero five.
- Sampling costs point one zero with tracking error of point three zero.
- Which has the smaller bad-year shortfall?
- Replication is point five five, sampling is point four zero, so sampling wins by point one five.
- That is the end of the quiz.