CHARTA LEARNING · LESSON NOTES

ETFs: price against NAV, costs, risks and uses

Portfolio Management

1 A story: the sealed jar and the shop window

- NAV is a label stamped once a day on the basket
- The ETF price moves all day on the exchange
- Premium: price above NAV. Discount: price below
- Two causes: a stale label, or a real gap

IN THE LESSON

- Imagine a jar of mixed sweets.
- Once a day, at closing time, a clerk counts the sweets, prices each one, and writes the total on a label.
- That label is the net asset value, or NAV, per share.
- It is the value of the basket at one moment, stamped and then left alone.
- Now picture a shop window where people trade the jar all day long.
- Their price moves with every rumour and every bit of news, while the label stays frozen until tomorrow evening.
- Most of the time the two agree closely.
- Sometimes they do not, and the whole question is why.
- Keep the frozen label and the busy shop window in mind.

2 Premium or discount to NAV

Premium = (Price − NAV) ÷ NAV

Premium or discount	Plus: premium. Minus: discount
ETF market price	Live exchange price
NAV per share	Stamped value per share

IN THE LESSON

- Here is the measure.
- The premium or discount is the market price of one ETF share minus its NAV per share, divided by the NAV.
- A positive answer is a premium: buyers are paying more than the label says.
- A negative answer is a discount.
- Say the NAV is forty dollars and the price is forty dollars and eighty cents.
- The gap is eighty cents, and eighty cents over forty dollars is two per cent.
- Notice that the measure itself says nothing about why the gap exists.
- It only reports a difference between a live price and a stamped number.
- Whether that difference is a mistake or just a reflection of timing is the next question.

3 Two reasons the gap appears

- Timing: the NAV is stale, the ETF price is current
- Common on funds holding foreign shares in closed markets
- Genuine: arbitrage by authorised participants is blocked
- Costly or impossible creation lets a gap persist

IN THE LESSON

- There are two families of reasons, and the exam wants you to tell them apart.
- The first is timing.
- Suppose the ETF holds Japanese shares, and the fund strikes its NAV from Tokyo closing prices.
- Tokyo then closes, but the ETF keeps trading in New York for hours.
- News arrives, and the ETF price moves to reflect it, while the NAV cannot move until Tokyo opens again.
- The gap is a clock, not a mistake.
- The second reason is a genuine one.
- Authorised participants, the big dealers who create and redeem ETF shares, normally keep the price near NAV by trading the gap away.
- If creating or redeeming becomes costly, slow or impossible, that force weakens and the gap can stay open.

4 Example 1: a premium that is only a clock

NAV $40.00 at Tokyo close; futures +2%; ETF $40.80

Reported premium	(40.80 − 40.00) ÷ 40.00	**2.0%**
Move since Tokyo close	futures	**+2.0%**
Fair value estimate	40.00 × 1.02	**$40.80**
Premium to fair value	(40.80 − 40.80) ÷ 40.80	**0.0%**
Verdict	not mispriced	**a clock**

IN THE LESSON

- Example one.
- An adviser at Marlin Capital sees a Japanese equity ETF listed in New York.
- Its NAV, struck at Tokyo's close, is forty dollars.
- During New York hours, futures on the Japanese index rise two per cent, and the ETF closes at forty dollars and eighty cents.
- The reported premium is two per cent.
- But the futures say the holdings are worth two per cent more than at Tokyo's close, so a fair value estimate is forty dollars times one point zero two, forty dollars and eighty cents.
- Against that estimate the premium is zero.
- The two per cent is the clock.
- Next day, if Tokyo opens up two per cent, the NAV simply catches up.

5 A price that moves, a NAV that cannot

Chart: Value per share ($) vs Time: Tokyo close to New York close

- NAV stays at $40.00
- ETF ends at $40.80
- Apparent premium 2.0%

IN THE LESSON

- Here is the example as a picture.
- The horizontal axis is time, from Tokyo's close on the left to New York's close on the right.
- The vertical axis is value per share in dollars.
- First the flat grey line at forty dollars.
- That is the NAV.
- It cannot change, because Tokyo is shut.
- Now the rising green curve, the ETF price.
- It starts at forty and climbs through the New York day as good news arrives, ending at forty dollars and eighty cents.
- The vertical distance at the right end is the apparent premium of two per cent.
- It is measured against a number that is hours out of date, so it does not prove anyone is overpaying.

6 When arbitrage closes a genuine gap

Arbitrage profit = Gap × shares − costs

Arbitrage profit	Why participants trade
Price gap to NAV	Basket value less ETF price
Creation or redemption cost	Sponsor fee plus basket trading

IN THE LESSON

- Now the genuine case.
- An authorised participant can swap an ETF for its basket, or a basket for ETF shares, in blocks called creation units.
- If the ETF is cheap, the participant buys ETF shares, redeems them for the basket, and sells the basket.
- The profit is the gap between the basket's value and the ETF price, minus the costs of doing it: the fee charged by the fund sponsor, and the trading costs of the basket.
- When the gap is smaller than those costs there is no profit and the gap stays.
- When it is bigger, trading closes it.
- So the gap is held within a band whose width is the cost of arbitrage.

7 Example 2: a discount worth trading

ETF $39.80, basket $40.00, unit 50,000 shares

Discount to basket	(39.80 − 40.00) ÷ 40.00	**−0.5%**
Gross gain	$0.20 × 50,000	**$10,000**
Sponsor fee	per creation unit	**$1,200**
Basket trading cost	0.05% × $2,000,000	**$1,000**
Profit per unit	10,000 − 1,200 − 1,000	**$7,800**

IN THE LESSON

- Example two.
- Another ETF holds domestic large shares that trade at the same hours as the ETF.
- It trades at thirty-nine dollars and eighty cents, while its basket is worth forty dollars a share.
- A creation unit is fifty thousand shares.
- The gap is twenty cents a share, a discount of half a per cent, so ten thousand dollars across the unit.
- The sponsor charges twelve hundred dollars, and trading the basket costs five hundredths of a per cent of its value, which is one thousand dollars.
- The profit is ten thousand less twenty-two hundred, seven thousand eight hundred dollars.
- The gap is wider than the cost band, so participants buy the ETF and the discount shrinks.

8 A story: the toll gate and the meter

- Toll gate: commission and bid-ask spread, paid in and out
- Meter: the expense ratio, running all year
- Short ride: the toll gate dominates
- Long ride: the meter dominates

IN THE LESSON

- Think of two ways to pay for a taxi ride.
- One taxi charges a fixed fee to get in, then very little per mile.
- The other has no entry fee, but a high meter rate.
- For a short hop the second is cheaper.
- For a long trip the first wins.
- Holding an ETF works the same way.
- The cost of getting in and out is the toll gate: commissions, and the gap between the price at which you can buy and the price at which you can sell.
- The cost of staying is the meter: the management fee, called the expense ratio, taken quietly from the fund's assets all year long.
- Which fund is cheaper depends on how long you ride.

9 Total cost of holding an ETF

Cost = 2c + s + f × T

Total holding cost	Percent of the investment
Commission, one way	Charged on purchase and on sale
Bid-ask spread	Full spread, counted once
Expense ratio	Annual fee
Years held	Holding period in years

IN THE LESSON

- Here is the formula, in per cent of the amount invested.
- The round trip trading cost is the commission twice, once to buy and once to sell, plus the bid-ask spread once.
- The spread is the difference between the price you pay and the price you receive, so a full round trip crosses it just once, not twice.
- To that add the expense ratio times the number of years held.
- Any premium paid or discount received relative to NAV would add to the trading side, but we assume the funds trade at NAV.
- Commissions twice, spread once, fee for every year.

10 Example 3: two funds, two holding periods

X: fee 0.09%, spread 0.10%. Y: fee 0.30%, spread 0.02%. Commission 0.02% each way

Round trip, X	2 × 0.02% + 0.10%	**0.14%**
Round trip, Y	2 × 0.02% + 0.02%	**0.06%**
One month	X 0.148%, Y 0.085%	**Y cheaper**
Five years, X	0.14 + 5 × 0.09	**0.59%**
Five years, Y	0.06 + 5 × 0.30	**1.56%**

IN THE LESSON

- Example three.
- Marlin Capital compares two ETFs that track the same index.
- Fund X has an expense ratio of nought point nought nine per cent and a spread of nought point one per cent.
- Fund Y has an expense ratio of nought point three per cent and a spread of nought point nought two.
- Commission is nought point nought two per cent each way on both.
- The round trip for X is two times nought point nought two plus nought point one, nought point one four per cent.
- For Y it is nought point nought six.
- Hold for one month, adding a twelfth of the fee, and X costs about nought point one four eight, Y about nought point nought eight five.
- Hold for five years and X costs nought point five nine, Y one point five six.

11 Two cost lines cross

Chart: Total cost (%) vs Years held

- Fund Y: steep fee
- Fund X: gentle fee
- Break-even about 4.5 months

IN THE LESSON

- Here are both funds on one picture.
- The horizontal axis is years held, from nought to two.
- The vertical axis is total cost in per cent of the investment.
- Look first at where each line starts.
- The starting height is the round trip: X begins at nought point one four and Y at nought point nought six.
- Now the slopes.
- The slope is the expense ratio, and Y's is more than three times X's, so its line climbs much faster.
- The lines cross at the break even point, about four and a half months.
- To the left of it Y is cheaper, to the right X is cheaper, and by more every year that passes.

12 Example 4: the break-even and the trap

Same two funds: when do the costs match?

Round-trip gap	0.14% − 0.06%	**0.08%**
Annual fee gap	0.30% − 0.09%	**0.21%**
Break-even	0.08 ÷ 0.21 years	**0.38 yr**
Trap: spread twice, X	0.04 + 2 × 0.10 + 0.0075	**0.248%**
Correct, X one month	0.04 + 0.10 + 0.0075	**0.148%**

IN THE LESSON

- Example four finds the break even exactly.
- At break even the two total costs are equal.
- The difference in round trip cost is nought point one four minus nought point nought six, nought point nought eight.
- The difference in annual fee is nought point three minus nought point nought nine, nought point two one.
- Divide, and you get nought point three eight years, about four and a half months.
- Hold for less and Y is cheaper, hold for longer and X is.
- Now the trap.
- Some candidates charge the full spread on the purchase and again on the sale.
- For X held one month that gives nought point two four eight, not nought point one four eight.
- Doubling the spread overstates the short term cost by two thirds.

13 A story: what is inside the wrapper

- Market risk of the holdings is the risk you expect
- Counterparty risk: swaps, securities lending, notes
- Closure risk: a small fund shut at a bad moment
- Expectation risk: a misread product

IN THE LESSON

- Picture a gift box.
- The label on the lid says what you hope is inside, but the real risks depend on how the box was built.
- An ETF has the risk of its holdings, which is market risk, and that you expect.
- This part is about the other risks, which come from the wrapper.
- First, counterparty risk.
- Some funds use swaps, or lend out their securities, and then the safety of your money depends on someone else keeping a promise.
- Second, fund closure risk.
- A small fund may be shut, and you are paid out at a time you did not choose.
- Third, expectation related risk.
- The product may work exactly as designed, yet not as you assumed.

14 Risks beyond the market

Three risks of the wrapper

Risk	Where it comes from
Counterparty	Swaps, lending, notes
Fund closure	Small fund shut or index change
Expectation	Misunderstood product design
Worst for notes	Counterparty

IN THE LESSON

- Here are the three in a table.
- Counterparty risk arises when a fund depends on a swap provider or lends securities to borrowers.
- If the other side fails, the fund may lose value or be unable to track its index.
- It is largest in exchange traded notes, which we meet shortly.
- Fund closure risk arises when a fund is too small to be worthwhile, or a regulatory or index change forces liquidation.
- The fund returns the proceeds, which may crystallise a gain or loss, and may create a tax bill at an unwelcome time.
- Expectation related risk arises when the buyer misreads the product, as with leveraged and inverse funds, which reset their exposure every day.

15 Example 5: the daily reset

Index +10% then −10%. Start at 100

Index	1.10 × 0.90	**0.99**
2× daily fund	1.20 × 0.80	**0.96**
−1× daily fund	0.90 × 1.10	**0.99**
Calm path: index	1.005 × 0.985	**0.9899**
Calm path: 2× fund	1.01 × 0.97	**0.9797**

IN THE LESSON

- Example five, the best known expectation trap.
- A leveraged fund promises twice the index's return each day.
- An index rises ten per cent one day and falls ten per cent the next.
- The index goes from one hundred to one hundred and ten, then to ninety-nine, down one per cent.
- The two times fund rises twenty per cent to one hundred and twenty, then loses twenty per cent of that larger amount, to ninety-six.
- It is down four per cent, not two.
- An inverse fund, promising minus one times the index each day, falls ten then rises ten, and ends at ninety-nine as well.
- It lost money even though the index fell.
- Each day the fund did exactly what it promised.
- The last two rows show a calm path, where the index ends near nought point nine nine and the two times fund near nought point nine eight, so the gap is small.

16 Losses over two days on the swinging path

Loss over two days (%)

Index	**1.0**
2x if naive	**2.0**
2x fund actual	**4.0**
Inverse fund	**1.0**

Daily resets compound; volatile paths hurt

IN THE LESSON

- Here is the swinging path as bars.
- The vertical axis is the loss over the two days, in per cent.
- The first bar is the index itself, down one per cent.
- The second bar is what a buyer of the two times fund might naively expect, twice the index loss, two per cent.
- The third bar is what the fund really lost, four per cent, double the naive figure.
- The last bar is the inverse fund, which also lost one per cent even though the index fell, the opposite of what the label suggests.
- The lesson is that volatility drives the gap.
- On a calm path, as the table showed, the same two times fund came close to twice the index.
- So these products suit short holding periods, not long ones.

17 Example 6: an ETN and its issuer

ETN $100,000; index +8%; issuer fails, recovery 30%

Index gain	8% of $100,000	**$8,000**
Amount owed by bank	100,000 + 8,000	**$108,000**
Recovery rate	unsecured creditors	**30%**
Amount received	108,000 × 30%	**$32,400**
Net result	32,400 − 100,000	**− $67,600**

IN THE LESSON

- Example six, for counterparty risk in its sharpest form.
- An exchange traded note is not a fund.
- It is an unsecured debt of the bank that issued it.
- The bank promises to pay the index return at maturity, and until then you hold its promise, not a basket of assets.
- An investor holds a hundred thousand dollars of a note on a commodity index.
- The index rises eight per cent, so the bank owes one hundred and eight thousand dollars.
- Now the bank fails, and unsecured creditors recover thirty cents on the dollar.
- The holder receives thirty-two thousand four hundred dollars.
- The index did exactly as hoped, yet the investor lost most of the money.
- A real ETF holds the assets in trust, so the fund sponsor's failure does not take them.

18 Four mistakes to avoid so far

- 1. A premium on a foreign ETF may just be a stale NAV
- 2. The spread is paid once in a round trip, not twice
- 3. An ETN is the bank's debt, not a basket you own
- 4. Daily resets: the multiple holds for one day only

IN THE LESSON

- Four mistakes to avoid so far.
- One.
- Reading a premium on an international ETF after its home market has rallied as proof that the fund is overpriced.
- Often it is the stale NAV that is wrong.
- Two.
- Charging the full spread on both the purchase and the sale, which counts it twice.
- Three.
- Treating an exchange traded note as if it carried the same risks as an ETF, when its main extra risk is the issuer's credit.
- Four.
- Expecting a leveraged or inverse fund to deliver its multiple over weeks or months.
- It resets every day, so the longer you hold and the more the market swings, the further it drifts from the label.

19 A story: one toolbox, many jobs

- Cash management: equitise idle cash
- Tilts and allocation: country, sector, style, factor
- Completion, rebalancing and transitions
- Hedging: short a sector or market ETF

IN THE LESSON

- Think of an ETF as a handy tool from the workshop wall.
- A hammer is not good or bad.
- It depends on the nail.
- Professional investors reach for ETFs for many jobs.
- When cash arrives and cannot be placed yet, an ETF can equitise it, so that the idle money earns market returns in the meantime.
- When a manager wants to shift weight towards a country, sector, style or factor, an ETF does it quickly and cheaply.
- When a portfolio has a gap, an ETF fills it.
- When managers are being replaced, an ETF holds the exposure in between.
- And when an exposure is unwanted, shorting an ETF can neutralise it without selling the holdings underneath.

20 Match the cost that matters to the job

- Equitise cash
- Hedge
- Transition
- Tactical tilt
- Completion
- Core holding

IN THE LESSON

- Here are the uses on one line, sorted by how long the position is held.
- The left end is short, where the trading cost is what hurts.
- The right end is long, where the annual fee builds up.
- At the far left sits equitising cash, held for weeks.
- Next is a hedge, held for as long as the unwanted exposure lasts.
- Then a transition, which holds exposure while one manager replaces another.
- In the middle is a tactical tilt, held for months.
- Further right are rebalancing and completion, which fill gaps for a year or more.
- At the far right is the core holding, kept for years.
- The further right, the more the expense ratio matters and the less the spread does.

21 Example 7: equitising a contribution

$10m for one month. A: fee 0.08%, spread 0.20%. B: fee 0.40%, spread 0.02%

A, trading cost	$10m × 0.20%	**$20,000**
A, one month's fee	$10m × 0.08% ÷ 12	**$667**
B, trading cost	$10m × 0.02%	**$2,000**
B, one month's fee	$10m × 0.40% ÷ 12	**$3,333**
Totals	A $20,667, B $5,333	**B cheaper**

IN THE LESSON

- Example seven.
- A pension fund advised by Marlin Capital receives a ten million dollar contribution that its managers will not invest for a month.
- It parks the cash in an equity ETF.
- ETF A has an expense ratio of nought point nought eight per cent and a spread of nought point two per cent.
- ETF B has an expense ratio of nought point four per cent and a spread of nought point nought two.
- Ignore commissions.
- For A the trading cost is twenty thousand dollars and one month of fee is six hundred and sixty-seven, a total of twenty thousand, six hundred and sixty-seven.
- For B the trading cost is two thousand and one month of fee is three thousand, three hundred and thirty-three, a total of five thousand, three hundred and thirty-three.

22 Example 8: a hedge without selling

$6m of sector shares; short $6m sector ETF; sector −10%

Loss on shares	10% × $6m	**−$600,000**
Gain on short ETF	10% × $6m	**+$600,000**
Spread cost	0.03% × $6m	**$1,800**
Borrow, two months	0.5% × $6m × 2 ÷ 12	**$5,000**
Cost of the hedge	1,800 + 5,000	**$6,800**

IN THE LESSON

- Example eight.
- A manager at Marlin Capital holds six million dollars of shares in the technology sector inside a larger portfolio, and fears a short setback for the sector, but does not want to sell, because of tax and because the stock picks are good.
- She shorts six million dollars of a sector ETF that tracks the same industry.
- Suppose the sector falls ten per cent.
- The shares lose six hundred thousand dollars, and the short gains six hundred thousand.
- The hedge costs a spread of nought point nought three per cent, eighteen hundred dollars, plus borrowing at half a per cent a year for two months, five thousand dollars.
- Total, sixty-eight hundred dollars, to remove the sector risk.

23 A transition and a core-satellite portfolio

Transition

Old manager leaves → Hold matching ETF → New manager hired → Sell ETF, buy shares

Core-satellite

Broad cheap core ETFs → Add factor tilt satellite → Add active satellite → Rebalance with ETFs

IN THE LESSON

- Two more jobs fit on one picture.
- The top row is a transition.
- A manager is being replaced.
- Instead of selling everything and sitting in cash, the investor moves the money into an ETF that matches the old exposure.
- The market exposure is kept while the new manager is hired, and then the ETF is sold as the new manager buys.
- The bottom row is a core satellite design.
- A large core of broad, low fee ETFs gives cheap market exposure.
- Smaller satellites, active managers or tilt ETFs for a factor or theme, aim to add extra return.
- Because the core is cheap and held for years, the fee matters most there.

24 The trap: choosing on the fee alone

- First the job, then the horizon
- Short job: spread, depth and borrow cost matter
- Long job: the expense ratio matters
- Always check the fund fits the exposure needed

IN THE LESSON

- The exam trap for this outcome is simple.
- Candidates see a lower expense ratio and pick that fund every time.
- We have just shown why that fails.
- In example seven the fund with five times the expense ratio was four times cheaper, because the position lasted only a month and the spread was the real cost.
- A short hedge also needs a deep, liquid fund that is easy to short and cheap to borrow.
- And a fund must fit the job, in the right market and with the right exposure, or the cost is irrelevant.
- First name the job, then the horizon, then the cost that matters at that horizon, and only then compare funds.

25 Recap: the whole lesson in one board

- Premium = (price − NAV) ÷ NAV; stale NAV is a clock
- Cost = 2c + s + f × T; break-even sets the winner
- Notes: issuer credit. Leveraged funds reset daily
- Match fund to job and horizon, not fee alone

IN THE LESSON

- Let us pull the lesson together.
- The premium or discount is price minus NAV over NAV.
- Arbitrage by authorised participants keeps it small, unless creation is costly, and on foreign funds a gap is often just a stale NAV.
- The cost of holding is commissions twice, plus the spread once, plus the fee for every year, so the toll gate dominates short holds and the meter dominates long ones.
- The wrapper adds counterparty risk, especially in notes, fund closure risk, and expectation risk from daily resets.
- And ETFs do many jobs, from equitising cash to hedging, where the best fund is the one that suits the job and the horizon.

26 Try three quick questions

1. NAV $50.00, price $50.50. Premium?
   Answer: 0.50 ÷ 50.00 = 1.0%.
2. Fee 0.20%, round trip 0.10%, held 3 years. Total cost?
   Answer: 0.10 + 3 × 0.20 = 0.70%.
3. Index +10% then −10%. A 2× daily fund?
   Answer: 1.20 × 0.80 = 0.96: down 4.0%.

IN THE LESSON

- Now try three quick questions yourself.
- Pause after each one.
- Question one.
- An ETF has a NAV of fifty dollars and trades at fifty dollars and fifty cents.
- What is the premium?
- Fifty cents over fifty dollars is one per cent.
- Question two.
- An ETF has an expense ratio of nought point two per cent, and a round trip trading cost of nought point one per cent.
- What is the total cost of holding it for three years?
- Nought point one plus three times nought point two is nought point seven per cent.
- Question three.
- An index rises ten per cent and then falls ten per cent.
- What happens to a two times daily fund?
- It goes up twenty then down twenty, ending down four per cent.
- Well done for working through them.