Trend Following and Managed Futures

Interview preparation summary · HF track

IN THIS SUMMARY

- Trend rules, signals and sizing
- Futures, returns and the industry

INT.HT.1.a · Trend rules, signals and sizing

Explain what trend following is (systematic rules that go long rising markets and short falling markets, across futures) and why trends may persist, and calculate the profit and loss of a simple trend rule across several markets.

Trend following is a systematic approach: fixed rules, not a forecast of fundamentals, decide whether to be long or short each market, and the position follows the direction of recent price moves. A fund buys markets that have been rising and sells short markets that have been falling, using futures on equity indices, bonds, currencies, commodities and interest rates, so it can take either side in any market and can hold many of them at once. The case for it rests on behaviour and flows: investors react slowly to news and then herd into winners, and some large participants, such as hedgers and central banks, trade for reasons that are not about profit, so prices can keep moving for longer than a fair-value view expects. It is the opposite of mean reversion, which bets that a market that has moved will move back. The rule is not a prediction of turning points: it is a way to stay with a move after it has begun, and to lose a little when markets reverse. Risk and portfolio construction ideas are covered in Risk and Portfolio Construction, and the broader economic setting in Markets, Macro and Current Affairs.

WORKED EXAMPLE: A SIMPLE TREND RULE ACROSS FOUR MARKETS

A fund uses a simple rule: be long a market if its price rose over the past twelve months, and short if it fell, with 25% of capital in each of four markets. The twelve-month changes and the changes in the following quarter are: equity index +15% then +6%, government bond future -4% then -3%, crude oil -20% then +8%, gold +10% then +5%. Work out the profit or loss of each position as a percentage of capital, the total, and compare it with a long-only holding in the same four markets.

Answer: The rule makes 1.50% of capital in the quarter: gains in equities, gold and the short in bonds, and a loss in crude oil where the trend reversed. A long-only holding made 4.0% in this quarter.

> **Interview tip:** Say that the rule follows price, not forecasts, that it can be short, and that it loses when a trend reverses. A calm, honest statement of the cost of reversals shows you understand the strategy.

INT.HT.1.b · Trend rules, signals and sizing

Describe the main trend signals (moving average crossover, breakout, momentum over several horizons) and how they are blended into one position, and compute a simple signal from prices.

A trend signal turns a price history into a direction and sometimes a strength. In a moving average crossover, the average of the last few days of prices (the fast average) is compared with the average over a longer window (the slow average): fast above slow means an uptrend and a long position, fast below slow means a short position. A breakout rule goes long when the price closes above its highest price over a look-back window and short when it closes below its lowest. A momentum signal uses the return over a past period, such as one month, three months or twelve months, often divided by the market's volatility so that signals are comparable across markets, and capped. Faster signals react sooner and trade more, so they pay higher costs and are whipsawed more often; slower signals trade less and ride long trends but give back more at turning points. Funds usually blend several signals and horizons, for example by averaging them with weights, so that the position is a fraction of full size when signals disagree. All signals lag, because they use only past prices, and none of them forecasts a turn. Parameters should not be tuned until they fit past data, a risk discussed in Quantitative Investing.

WORKED EXAMPLE: CROSSOVER, BREAKOUT AND A BLEND

Daily closing prices for an invented market are 100, 99, 98, 97, 98, 100, 103, 105, 104, 106, 108, 107, 105, 102 (days 1 to 14). A rule compares the 3-day average with the 6-day average, and a breakout rule compares the close with the highest and lowest closes of the previous five days. Find the signals on day 7 and day 14. Then blend the crossover, the breakout and a twelve-month momentum signal that is long (+1), with equal weights, on day 14.

Answer: On day 7 both signals are long. On day 14 the crossover and the breakout are short and the momentum is long, so the blended position is 0.33, a short of a third of full size.

> **Interview tip:** Define the signal, give a number and state its weakness: it lags. Mention the speed trade-off and that blending reduces reliance on one parameter.

INT.HT.1.c · Trend rules, signals and sizing

Explain volatility targeting and position sizing and the diversification across asset classes, calculate position sizes from a risk budget, and show how the correlation of trends affects portfolio risk.

A trend following fund sizes each position so that it contributes a chosen amount of risk, not an equal amount of money. Volatility targeting sets the notional position as the risk budget divided by the market's volatility: a calm bond future gets a large notional and a volatile commodity gets a small one, and if a market's volatility doubles the position is halved. The number of futures contracts is the notional divided by the value of one contract. This keeps the risk from any one market stable and means the fund's total risk does not swing with market conditions. The fund trades many markets across equity indices, bonds, interest rates, currencies and commodities because trends occur at different times in different markets and because their returns are not fully correlated. But the benefit depends on correlation: for a given risk per position the portfolio volatility rises with the correlation between the positions, and in a stress many trends can line up, for example short equities and long bonds in a flight to safety. Funds therefore also look at the correlation of their positions, not only of the markets, and may cap the risk in a group of related markets. See also Risk and Portfolio Construction.

WORKED EXAMPLE: SIZING FOUR MARKETS TO ONE RISK BUDGET

A fund has 200m of capital and gives each of four markets a risk budget of 4% of capital in annualised volatility. Market volatilities are 16% for an equity index (one contract is worth 250,000), 5% for a government bond future (100,000 a contract), 32% for crude oil (100,000 a contract) and 20% for gold (200,000 a contract). Find each notional position and number of contracts, then the total notional. Then find the equity position if its volatility doubles to 32%, and the portfolio volatility of four such positions if the correlation between any two is 0 and if it is 0.3.

Answer: The positions are 50m, 160m, 25.0m and 40m, or 200, 1,600, 250 and 200 contracts. Portfolio volatility is 8.0% with no correlation and 11.0% with a correlation of 0.3.

> **Interview tip:** Say that equal risk is not equal money, give the formula, and say what happens when volatility changes. Then raise correlation unprompted: diversification is weaker in a stress.

INT.HT.2.a · Futures, returns and the industry

Explain futures mechanics (margin, rolling, contango and backwardation, roll yield), transaction costs, slippage and capacity, and calculate notional, margin, roll cost and trading costs.

A futures contract is an agreement to buy or sell at a set price on a future date. Trading it needs only margin: an initial deposit, a small fraction of the contract's value, with daily variation margin paid or received as the price moves, so the notional position can be many times the cash set aside, and the fund's leverage is a choice made through position size. A fund that wants to hold a position for longer than the contract lasts must roll, selling the nearby contract and buying a later one. When later contracts are priced above nearer ones the curve is in contango, and a long position that is rolled loses the difference each time when prices are otherwise unchanged, a negative roll yield; a short position gains it. In backwardation, where later contracts are cheaper, the roll yield is positive for a long. Trend followers can be long or short, so roll yield works for or against them depending on the position and the curve. They also pay commissions and slippage, the difference between the price expected when the signal fires and the price achieved, and costs rise with turnover. Because large orders move prices, there is a limit to the assets a strategy can manage without cutting its return, its capacity, and the least liquid markets reach it first.

WORKED EXAMPLE: A CRUDE OIL POSITION THROUGH CONTANGO

A fund holds 100 contracts of an invented crude oil future. One contract is 1,000 barrels, the price is 80.00 a barrel and the initial margin is 6,000 a contract. The next contract is priced at 81.00, and the curve stays that way each month while the spot price stays the same. Work out the notional and margin. Then find the roll cost per month for a long and the annual effect over 12 rolls, and the result if the price trends up 18% over the year. A round trip costs 29 a contract.

Answer: The notional is 8.0m on 0.6m of margin. Rolling a long through this contango costs about -13.8% a year, leaving 1.7% from an 18% trend.

> **Interview tip:** Describe margin as leverage that the fund chooses, and explain roll yield by saying who pays and who is paid. Mention costs and capacity, because they matter more as a fund grows.

INT.HT.2.b · Futures, returns and the industry

Describe the return profile of trend following (positive skew, convexity, crisis alpha, flat periods, whipsaw and drawdowns) and the role of risk management and leverage, with simple calculations.

Trend following typically wins on a minority of trades and loses a little on the rest. Winners are held while the trend lasts and losers are cut when the signal reverses, so the distribution of returns has positive skew: many small losses and a few large gains. The payoff resembles owning an option on large moves in either direction, a property called convexity, so it tends to lose when markets are range-bound and gain when large trends develop. In some past equity falls, trend followers were able to profit by being short, which is called crisis alpha, but this is not guaranteed, because a crisis that reverses quickly can hurt the strategy instead. The return pattern includes long flat periods and whipsaw losses when markets repeatedly reverse, and drawdowns can last for a year or more. Leverage scales all of it: doubling positions roughly doubles volatility and the size of drawdowns, and larger losses need a larger gain to recover, because a fall of 50% needs a rise of 100%. Risk management is therefore about the target volatility, caps on groups of related markets, stops in signals and rules for how risk is cut after losses and restored after gains.

WORKED EXAMPLE: THE PAYOFF OF A TREND FOLLOWER

Over a year a trend follower in one market makes ten trades. Six lose 1.0 unit each and four win 1.5, 2.5, 5.0 and 9.0 units. Find the hit rate, the average win and the average result per trade, the break-even hit rate for that payoff, and the effect of eight losing trades in a row at 1% of capital each (compounded). What does this say about the strategy?

Answer: The hit rate is 40%, the result is 12.0 units (1.2 per trade), and a break-even hit rate is 18.2%. A run of eight losses costs 7.7% and needs 8.4% to recover.

> **Interview tip:** Say that the profit comes from the size of the winners, not the hit rate, and that this creates a long run of small losses. State that crisis alpha is a tendency, not a promise.

INT.HT.2.c · Futures, returns and the industry

Measure performance (Sharpe ratio, drawdown, correlation to equities), explain the CTA industry structure and fees, and describe how a systematic strategy is presented to an allocator.

Performance is measured by return, volatility and the shape of losses. The Sharpe ratio is the return above cash divided by the volatility of returns. Drawdown is the fall from a peak to a later low, and the time taken to recover matters as much as its size. Correlation to equities shows whether the fund diversifies a portfolio, and it is the correlation in a falling equity market that counts most. The industry of commodity trading advisors, or CTAs, includes firms that run futures strategies under a regulator's registration or equivalent, offering pooled funds, regulated fund structures and separately managed accounts. A typical fee is a management fee of about 1% to 2% of assets and a performance fee of about 20% of profits, paid only above the high-water mark, the highest value reached by the fund's net assets, so that investors do not pay twice for the same recovery. Fees take a large share of gross returns, so Sharpe ratios should be compared after fees. When presenting to an allocator, say what the strategy does, what role it plays in the portfolio, how it behaves in different markets, how often and how long it loses, how it is sized, and what would make the investor lose confidence. Compare the discussion of fees in Asset Management: Industry and Economics.

WORKED EXAMPLE: FROM GROSS RETURN TO NET SHARPE, AND A HIGH-WATER MARK

A trend following fund earns a gross return of 14% with a volatility of 15%. It charges a 2% management fee and a performance fee of 20% of the profit after the management fee. Cash earns 3%. Find the net return, the gross and net Sharpe ratios and the share of the gross return paid in fees. Then consider a fund with NAV 100 that falls 10% in year 1 and rises 12% in year 2 before performance fees: how much performance fee is due in year 2 with a high-water mark, and without one? (Ignore the management fee in this part.)

Answer: The net return is 9.6%, the Sharpe ratio falls from 0.73 to 0.44 and fees take 31% of the gross return. The performance fee is 0.16 with a high-water mark and 2.16 without one.

Interview tip: Always compare Sharpe ratios after fees, and explain the high-water mark in one sentence. Then give the allocator the role of the fund, how it can lose and how long it can take to recover.

Summary of the Charta interview-preparation topic. Companies and figures in the examples are invented. Draft content, not yet expert reviewed.