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QUANT JOB INTERVIEW QUESTIONS & ANSWERS

of [Quantitative Hedge Fund Training](#)

Interview Preparation Overview

Are you preparing for an interview for a quantitative role and have no idea of what to expect? Look no further! In this chapter, we will show the types of questions you should expect to face in a quantitative job interview. Building on this, in the next chapter we will give you [primers for Mathematical Finance, Econometrics and Statistics](#), which will cover some basics all prospective Quantitative Analysts must be familiar with.

Many of the questions in this chapter do not relate to quantitative finance in any kind of direct way. However, they are designed to test your ability to think through quantitative problems. These questions demonstrate that being an effective Quantitative Analyst does not simply equate to having detailed knowledge of complex formulas. Rather, you need to be able to think on your feet, and these questions test that ability.

Know that almost all of your interview questions will relate in some form to mathematics, statistics, econometrics or programming. Think of interviewing as an opportunity to demonstrate how many skills you have accrued in these areas. Do not be upset if there is some area covered in an interview question that you've never been exposed to—the goal is not to demonstrate that you know everything. It is to demonstrate that you know a lot, and you know how to work with the knowledge that you do have. Keep your answers focused, but include relevant techniques you might incorporate into solving a problem, and be prepared to explain how you'd use such methods.

Here's an example. Are you being asked to value a customized stock option? Talk about the valuation framework, and how you might forecast future prices using a Monte Carlo simulation technique. (What type of drift and volatility process will your simulation incorporate?) Remember that you should be prepared to fully detail any concept you mention during a conversation. Don't use the phrases "Markov process", "risk-neutral measure" or "Bayesian inference" unless you're prepared to explain these topics. Even if you don't answer a specific question correctly, talking about other concepts you're familiar with during the interview process may give you an opportunity to "redeem" yourself.

And don't be afraid to ask questions, too! An intelligent question—whether about how something is modeled, how portfolio risk is calculated, or how an asset is valued can go a long way to proving that you are the type of employee who will be engaged and willing to go the extra step to solve unanswered questions or improve an existing process.

Basic Personality/Standard Interview Questions

In any interview, expect the hiring manager to request that you “walk” them through your resume. The interviewer may be asking you this because he or she did not have time to read through your resume before meeting you. Or, he or she may want to see which areas of your background you choose to focus on, and how effectively you communicate. Either way, this is your opportunity to show why your past experience makes you a fit for this job. Emphasize any classwork, projects, work or teaching experience that is relevant to the Quant world.

Note that for non-technical questions, it is not just the content of your responses that matters—just as important is the manner in which you verbalize them. Are you confident? Are you at a loss for words? Be quick on your feet, but be thoughtful as well.

Some other questions in this area might include:

Tell me something about yourself that is not listed on your resume.

What is the riskiest thing you've ever done?

Are you more risk-averse or risk-seeking? Give me an example.

What is your greatest weakness?

How do you feel about waking up early or staying up late?

What are your interests outside the classroom/office?

Why should we hire you?

What is your favorite class that you took?

Who has personally influenced you the most? Name someone whom you've never met who's been a strong influence.

Tell me about your biggest failure or a period of adversity.

Discuss a difficult ethical decision you recently faced.

What's the last book you read?

Brainteasers/Quantitative Interview Questions

As we mentioned, most interview questions will relate in some form to mathematics, statistics, econometrics or computer programming. You may get finance-specific questions if you've studied

finance at university or worked in finance before, but the main goal of the interview will be to determine your ability to think through quantitative concepts. Don't be afraid to ask questions if you need help, and just as you would in school, when you are faced with challenging questions given in this chapter, always show your work, and explain your thought process.

Here are some examples.

IF YOU LOOK AT A CLOCK AND THE TIME IS 12:15, WHAT IS THE ANGLE BETWEEN THE HOUR AND THE MINUTE HAND?

We know that at 12:15 the angle is slightly less than $\frac{1}{4}$. Why? Because the hour hand needs to move from "12" to "1" over the course of an hour, the hour hand is a little past 12 (and thus the angle is a bit less than 90). Start off with the basics – a clock, which is a circle, is 360 degrees.

Each hour on the clock represents 30 degrees (360 degree clock divided by 12 hours).

Now, the minute hand has only moved $\frac{1}{4}$ of the way through the hour (the minute hand is at 15, which is $\frac{1}{4}$ of the way around), so the hour hand has moved 7.5 degrees (30 degrees per hour times $\frac{1}{4}$ move in the minute hand). Now we know the hour hand moved 7.5 degrees, so the answer is 82.5 degrees (90-7.5).

A CAR TRAVELS A DISTANCE OF 60 MILES AT AN AVERAGE SPEED OF 30 MPH. HOW FAST WOULD THE CAR HAVE TO TRAVEL FOR THE SAME 60 MILE DISTANCE HOME TO AVERAGE 60 MPH OVER THE ENTIRE TRIP?

This is a trick question: it's impossible. The first trip took 2 hours (60 miles / 30 mph). In order for you to average 60 mph over the entire trip you would have to travel for 2 hours (120 miles / 60 mph). Since you already were driving for 2 hours it is impossible for you to average 60mph for the entire trip.

HOW MANY HERSHEY'S CHOCOLATE BARS WERE SOLD IN THE US LAST YEAR?

Variants on a theme include: how many gallons of ice cream were sold in the U.S., how many fax machines are in use in NYC...or anything else that requires you to extrapolate from a limited set of information. One of the many possible approaches is to start by looking at the total U.S. population, dividing the population into the most relevant age groups, estimating the "consuming habit," etc., and assigning a consuming frequency for each group, before summing to arrive at the total market size. Start with the fact that the U.S. population is approximately 330 million (the population in Manhattan is 1.6mm; check the figures for the city in which you're interviewing). Here, the answer will not matter so much as your thought process. Include seasonal impacts—more chocolate bars may be bought on Valentine's Day and Halloween, so add in the fact that consumption is not evenly distributed

throughout the year. Chocolate bars are mostly consumed by people between ages 5 and 70; each of these people may consume approximately 12 to 20 chocolate bars a year...

YOU HAVE A FIVE-GALLON JUG AND A THREE-GALLON JUG. YOU MUST OBTAIN EXACTLY FOUR GALLONS OF WATER. HOW WILL YOU DO IT?

Fill the five-gallon jug and then pour it into the three-gallon jug. The five-gallon jug has 2 gallons left. Now throw the three-gallon water away. Pour the 2 gallons from the five-gallon jug to the three-gallon jug. So now the three-gallon jug has just 2 gallons of water. Fill the five-gallon jug again, and pour 1 gallon to the three-gallon jug. You are then left with 4 gallons of water in the five-gallon jug.

YOU ARE FACED WITH TWO DOORS. ONE DOOR LEADS TO YOUR JOB OFFER (THAT'S THE ONE YOU WANT!), AND THE OTHER LEADS TO THE EXIT. IN FRONT OF EACH DOOR IS A GUARD. ONE GUARD ALWAYS TELLS THE TRUTH. THE OTHER ALWAYS LIES. YOU CAN ASK ONE QUESTION TO DECIDE WHICH DOOR IS THE CORRECT ONE. WHAT WILL YOU ASK?

Ask a guard: "If I were to ask you if this door were the correct one, what would you say?" The truthful consultant would answer yes (if it's the correct one), or no (if it's not). Now take the lying consultant. If you asked the liar if the correct door is the right way, he would answer no. But if you ask him: "If I were to ask you if this door were the correct one, what would you say?" he would be forced to lie about how he would answer, and say yes.

Alternatively, you could ask one of the guards whether the other guard would say that Door 1 is the correct door to enter. If you ask the lying guard, he will lie about what the other guard would say. Alternatively, if you ask the truthful guard, he would honestly tell you what the other guard would say, which will be a lie. In either case, chose the other door—whichever door is not indicated by the response to your question.

YOU ARE PLAYING A CARD GAME AGAINST ONE OPPONENT. THE GAME STARTS WITH 21 CARDS ON A TABLE. YOU AND YOUR OPPONENT ALTERNATE TURNS, AND DURING EACH TURN, A PLAYER MAY PICK UP 1, 2 OR 3 CARDS. THE WINNER IS THE PERSON THAT PICKS UP THE LAST CARD. YOU GO FIRST. WHAT IS YOUR FIRST MOVE, AND WHAT IS THE OPTIMAL STRATEGY TO WIN THIS GAME?

You pick 1 card first (leaving 20), then you want to respond to all opponent picks by picking a number that totals 4 combined with their last pick. So, you pick 1. Then, if they pick 3, you pick 1...if they pick 2, you pick 2...if they pick 1, you pick 3. This ensures that you're always leaving them with a multiple of 4 (first 20, then 16, 12, 8, 4), right until the end, when you leave them with exactly 4. When they're stuck with 4, they are out of luck, because regardless if they pick 1, 2 or 3, you will be able to win in the next turn.

YOU ARE GIVEN 9 MARBLES THAT LOOK THE SAME, BUT 1 OF THEM WEIGHS SLIGHTLY LESS THAN THE OTHER 8. YOU ARE ALSO GIVEN A BALANCE SCALE. WHAT IS THE LEAST NUMBER OF TIMES YOU COULD USE THE BALANCE TO DETERMINE WHICH OF THE MARBLES IS THE LIGHTER ONE? (ALSO EXPLAIN THE DIFFERENT BALANCE WEIGHTINGS YOU WOULD PERFORM).

On the first weighing, you would weigh three marbles on each side, leaving three off. If one side of the scale is lighter, you are left with three marbles. Then you would place one marble on each side of scale, and leave one off. This method will identify the light marble while only performing two weightings in total.

FOUR PEOPLE ARE ON ONE SIDE OF A BRIDGE AT NIGHT AND WOULD LIKE TO CROSS IT. ONLY TWO CAN CROSS AT A TIME. IN ORDER TO CROSS, A FLASHLIGHT MUST BE USED. THERE IS ONLY ONE FLASHLIGHT. THE FOUR PEOPLE EACH TAKE DIFFERENT AMOUNTS OF TIME TO CROSS THE BRIDGE, SO IF TWO PEOPLE CROSS TOGETHER, THEY WILL CROSS AT THE SPEED OF THE SLOWER PERSON (SINCE THEY NEED TO BE TOGETHER AND USE THE FLASHLIGHT). DESCRIBE HOW ALL FOUR PEOPLE CAN REACH THE OTHER SIDE OF THE BRIDGE IN 17 MINUTES, WITH THE FOLLOWING TIMES FOR EACH PERSON TO CROSS AS FOLLOWS: PERSON A: 1 MINUTE; PERSON B: 2 MINUTES; PERSON C: 5 MINUTES; PERSON D: 10 MINUTES.

A & B across (2 minutes), A comes back (1 minute), C & D across (10 minutes), B comes back (B was left there from the first move) (2 minutes), A & B across (2 minutes).

WHAT IS THE SUM OF THE NUMBERS FROM 1 TO 50?

Pair up the numbers into groups of 51 ($1 + 50 = 51$; $2 + 49 = 51$; etc). Twenty-five pairs of 51 = 1,275.

A COMPANY HAS TEN MACHINES THAT PRODUCE GOLD COINS. ONE OF THE MACHINES IS PRODUCING COINS THAT ARE A GRAM LIGHT EACH. HOW DO YOU TELL WHICH MACHINE IS MAKING THE DEFECTIVE COINS WITH ONLY ONE WEIGHING?

Every machine will have to produce a sample coin or coins, and you must weigh all these coins together. How can you indicate which coins came from which machine? If every machine cranks out a different number of coins (machine 1 makes one coin, machine 2 makes two coins, and so on, then taking all the coins and weighing them together against their theoretical weight will give you the answer. If you're four grams short, for example, you'll know that machine 4 is defective.

YOU HAVE 18 BLUE SOCKS AND 14 BLACK ONES IN A DRAWER. IT IS VERY DARK. HOW MANY DO YOU HAVE TO PULL OUT BEFORE YOU HAVE MATCHING PAIR?

You need to pick three socks. No color was specified so after choosing three socks, two should be same color.

SAY YOU ARE DRIVING ON A ONE-MILE TRACK. YOU DO ONE LAP AT 30 MILES AN HOUR. HOW FAST DO YOU HAVE TO GO ON THE SECOND LAP TO AVERAGE 60 MILES AN HOUR?

The first thought of many people is to say 90 miles an hour, since the average of 30 and 90 is 60, but remember your junior high math: $\text{Rate} \times \text{Time} = \text{Distance}$. If you've completed a lap at 30 miles an hour, then to have driven a mile on the mile-long track, you've already taken two minutes. Two minutes is the total amount of time you would have to take in order to average 60 miles an hour. Therefore, you cannot average 60 miles an hour over the two laps.

YOU AND YOUR FRIEND GO OUT TO DINNER TOGETHER, AND THE BILL IS \$25. YOU AND YOUR FRIEND EACH PAY \$15 IN CASH WHICH YOUR WAITER GIVES TO THE CASHIER. THE CASHIER HANDS BACK \$5 TO THE WAITER. THE WAITER KEEPS \$3 AS A TIP AND HANDS BACK \$1 TO EACH OF YOU. SO, YOU AND YOUR FRIEND PAID \$14 EACH FOR THE MEAL, FOR A TOTAL OF \$28. THE WAITER HAS \$3, AND THAT MAKES \$31. WHERE DID THE EXTRA DOLLAR COME FROM?

This is one of those brainteasers where if you remember the basics ($\text{bill} + \text{tip} = \text{total meal cost}$) you'll be fine. The bill was \$25; you and your friend collectively leave a \$3 tip. The total meal cost is \$28. If you each pay \$14, you're paying \$14 for the meal AND the tip. You each paid \$12.50 for the meal (half of \$25), \$1.50 for a tip (half of \$3) and each got back \$1 in change. Add it all up and it comes to \$15 each, for a total of \$30.

YOU'RE STANDING AT THREE LIGHT SWITCHES AT THE BOTTOM OF THE STAIRS TO THE ATTIC. EACH ONE CORRESPONDS TO ONE OF THREE LIGHTS IN THE ATTIC, BUT YOU CANNOT SEE THE LIGHTS FROM WHERE YOU STAND. YOU CAN TURN THE SWITCHES ON AND OFF AND LEAVE THEM IN ANY POSITION. HOW CAN YOU IDENTIFY WHICH SWITCH CORRESPONDS TO WHICH LIGHT BULB IF YOU ARE ONLY ALLOWED ONE TRIP UPSTAIRS?

Turn on the first two switches and leave them on for 5 minutes. After 5 minutes, turn off the second switch, leaving the first switch on. Now go upstairs to the attic. The light that is on is connected to the first switch. A light that is off but has a bulb that is still warm to the touch is connected to the second switch. The light that is both off and cold to the touch is connected to the third switch, which was never turned on.

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